INTEGRATED

NATURAL RESOURCES

MANAGEMENT PLAN

2001 - 2005

24TH Infantry Division (Mechanized)
And
Fort Riley Army Installation

Directorate of Environment and Safety
Conservation Division

I. In accordance with Title 10, U.S. Code Section 2671: Title 16, U.S. Code, Section 670; and in Public Law 86-797, as amended, the Department of Defense, Department of Interior, and the State of Kansas, through their duly designated representatives whose signatures appear below, approved the following Integrated Natural Resources Management Plan (INRMP) for the protection, development and management of natural resources on the Fort Riley Military Reservation, Kansas.

II. This INRMP will be in full force and effect upon its adoption. Adoption will be indicated by signatures below of duly authorized representatives of the three agencies first above named; will remain in full force and effect as long as permitted by the cited authorities under which it is entered.

III. This INRMP supercedes previous *Cooperative Agreement for the Conservation and Development of Wildlife Resources on the Fort Riley Military Reservation* among Fort Riley, the Kansas Department of Wildlife and Parks and the U.S. Fish and Wildlife Service. This INRMP may be amended or revised by agreement among all parties hereto. Any proposed amendment of this Plan may originate with any of the participating agencies.

_____ _____

Robert J. St. Onge, Jr. Date
Major General, U.S. Army
Commanding General

_____ _____

Steve A. Williams Date
Secretary
Kansas Department of Wildlife and Parks

_____ _____

Ralph O. Morgenweck Date
Regional Director
U.S. Fish and Wildlife Service

Fort Riley Integrated Natural Resources Management Plan

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EXECUTIVE SUMMARY

This document details Fort Riley's adaptive management plan for managing natural resources to support and be consistent with the military mission while also protecting and enhancing those resources for multiple use, sustainable yield, and biological integrity. Its purpose is to ensure that natural resources conservation measures and other Army activities on Fort Riley are integrated and consistent with Federal stewardship requirements. It is organized according to, and contains those elements prescribed by, "Guidelines to Prepare Integrated Natural Resources Management Plans for Army Installations and Activities" (U. S. Army Environmental Center, 1997).

Environmental Compliance

Many Federal and state laws and regulations, Executive Orders, and Department of Defense (DoD) and Army regulations, instructions, and other policy documents direct and guide natural resources management on Fort Riley. Some of the most significant Federal laws are the Sikes Act of 1960 (P.L. 99-561) and the Sikes Act Improvement Act of 1997 (P.L. 105-85), the National Environmental Policy Act of 1969, the Endangered Species Act of 1973 and its amendments, and the Federal Insecticide, Fungicide and Rodenticide Act and its amendments. Kansas laws with the greatest environmental impact are the Kansas Nongame and Endangered Species Act of 1972, K.S.A. 47-1809 Section 2 of 1995, which requires control of feral swine, and Kansas's Noxious Weed Law, as amended in 1998.

Primary DoD direction is provided in Department of Defense Instruction (DoDI) *Environmental Conservation Program* (DoDI 4715.3), and Department of Defense Directive *Environmental Security* (DoDD 4715.3). Army guidance is provided by Army Regulations (AR) *Environmental Effects of Army Actions* (AR 200-2), *Natural Resources--Land, Forest and Wildlife Management* (AR 200-3), and *Pest Management* (AR 200-5). Also, Fort Riley regulations substantially affect natural resources management and use of natural resources for recreation. Chief among those are the *Fort Riley Hunting and Fishing Regulations* (FR 210-15), *Fort Riley Range Regulations* (FR 385-12) and the *Fort Riley Private-Owned Weapons Regulations* (FR 190-1). The latter, for example, requires hunters to register firearms brought onto the installation.

Scope

This plan addresses the Army's efforts to protect and otherwise manage the natural resources of Fort Riley, a 100,656-acre U. S. Army facility located in Geary, Riley, and Clay Counties of northeastern Kansas. The fort is predominantly grassland interspersed with linear communities of woodlands, highly variable in width, associated with streams; other woodland plantings; relatively small, man-made water impoundments; and structures. The installation's community is representative of mid-continent species dependent upon those physiographic and floral features. The fauna (as well as to a more limited degree the flora) in some areas are further influenced by their proximity to

Milford Lake, a 15,000-acre impoundment adjacent to the fort. The plan describes the fort, its natural resources, and the activities currently undertaken and planned through 2005 to manage those resources. It assigns responsibilities for management actions and describes funding requirements for those actions.

Relationship of Natural Resource Management to military mission

Military training and training support undertaken on Fort Riley affect the installation's natural resources and the management of those resources in three specific ways: construction of facilities, maneuver activities, and ordnance explosions. Naturally, those activities impact the installation's soils, water, vegetation, and fish and wildlife. Similarly, those resources and their management affect the military mission. For instance, the generally rolling topography covered by grasslands, interspersed by streams and wooded areas, provides a variety of terrain types useful for both mounted and dismounted activities. Fortunately, measures taken to manage the resources, including protection of threatened and endangered species, impose minimal restrictions on the fort's military mission and in many instances enhance that mission (e.g., improvement of low-water stream crossings both improves safety of soldiers training and water quality in the streams).

Partnerships

The installation's partners in implementing this plan include higher-level Army Command Agencies, other Federal Agencies, state and local agencies, local universities, non-profit conservation organizations, and other interested parties. Existing partnerships are described in Section 5.

Planned Major Initiatives

Much of Fort Riley is open, flat to rolling topography that lends itself well to force-on-force maneuver training, the principal military mission of the fort. We can assume that the fort's military mission will not dramatically change in the foreseeable future. Therefore, planned resource management activities are those that will sustain the current vegetative cover and associated fauna, rather than those designed to shift relative proportions or distribution of flora and fauna. Critical activities for the period covered by this plan, in priority order, follow:

- Maintenance of grasslands' vigor and distribution through prescribed burning.
- Protection of threatened and endangered species.
- Sustainment of the fort's Integrated Training Area Management (ITAM) activities.
- Update of Planning Level and annual surveys of installation natural resources.

- Sustainment of hunting, fishing, and other natural resources-based recreational opportunities for soldiers, their dependents, and the general public.

- Control of noxious weeds and nuisance wildlife.

- Promotion of species-diverse riparian woodlands and rehabilitation of upland woodlots and hedgerows.

- Maintenance of Agricultural Outleasing.

Costs and Benefits

The annual cost to implement this five-year plan is approximately $4 million, and the single largest funding requirement is for the ITAM program, which is projected to range from $900,000.00 to approximately $1,000,000.00 each year. The largest component of that requirement and other program requirements is salary for both government and contracted employees.

Full implementation of this plan will achieve the goal established by the Army to conserve their natural resources while accomplishing their primary purpose of providing "Soldiers on point for the nation, persuasive in peace, invincible in war" (Secretary of the Army 1999). It will accomplish that through an integrated ecosystem management approach that will maintain the four levels of biodiversity: genetic diversity, species richness, ecosystem diversity, and landscape diversity.

Summary

Fort Riley's INRMP is comprised of 17 sections based on the format prescribed by Army guidance. The first section, *Goals and Policies*, describes the Army's and Fort Riley's commitment to natural resources stewardship to support the trained and ready soldier. Sections 2 through 7 are descriptions of the installation itself, the military mission and the abiotic and biotic environment of Fort Riley. Section 8, *Natural Resources Management*, is the core of the INRMP that lays out Fort Riley's strategies, prescriptions, actions and decisions for managing various resources. This section also discusses the integration of the military mission with natural resources management and integration among various management programs. The remainder of the INRMP describes other elements of natural resources management such as Law Enforcement and Outdoor Recreation. One of the most important of these is Section 17, *Implementation*, that describes the organization and funding required to implement this INRMP and program/project priorities.

1.0 POLICIES AND GOALS

Army Environmental Vision Statement

The Army will be a national leader in environmental and natural resources stewardship for present and future generations as an integral part of our mission (Army Policy Institute, 1992).

1.1. Policies

The *Commander's Guide to Environmental Management* states that the Army's program for natural resources management is based on "conservation: the protection, improvement and use of natural resources according to principles that provide optimum public benefit and support of the military mission for present and future generations" (U.S. Army Corps of Engineers, 1991).

1.1.1. Ecosystem Management

An ecosystem approach to natural resources management taking into account ecological, socio-economic, and institutional considerations is DoD and Army policy (Leslie, 1996). Forces Command (FORSCOM) policy is for installations to manage lands for long-term sustainable vegetative cover to optimize training while supporting populations of native fauna and flora. Implementation of this policy emphasizes management for "historic ecosystem(s)" that can be replicated "feasibly and effectively" (FORSCOM Policy Memorandum 200-97-1, Subject: Implementation of Ecosystem Management).

Principles of, and guidelines for, ecosystem management are prescribed in DoDI 4715.3, *Environmental Conservation Program.* One of the most critical elements of an ecosystem approach is adaptive management. Adaptive management on Fort Riley takes into account changes in military mission and associated training requirements, land-use, and the nature and extent of managed natural resources. Adaptive management requires adjusting management practices to these changes to promote ecosystem health while enabling accomplishment of the military mission and allowing ancillary uses of the fort's natural resources. Included among those ancillary uses are the production of fuel, fiber, and food, recreation, education, promotion of a positive image of the Army, and furthering economic growth of the surrounding region.

1.1.2. Biodiversity Conservation

The DoD's *Conserving Biodiversity on Military Lands: A Handbook for Natural Resources Managers* (Leslie et al., 1996) defines biodiversity (biological diversity) as "the variety of life and its processes." The *Handbook* describes four levels of biodiversity that natural resources managers must consider to fully implement ecosystem management: genetic diversity, species richness, ecosystem diversity, and landscape diversity.

The *Handbook* emphasizes three major points for DoD natural resources managers. The first is that biodiversity conservation is a public mandate. Secondly, DoD has the management responsibility of more than 25 million acres of land within the continental United States. Thirdly, conserving biodiversity results in ecosystem integrity and, thus, sustainable training lands.

Management of Fort Riley's natural resources provides for the four levels of biodiversity conservation. First, planting native plant species and protecting threatened and endangered (and other rare) species conserves genetic diversity. Next, protecting and restoring habitats and reintroducing extirpated species, such as elk, conserves species richness. Then, protecting the integrity of native tallgrass prairie processes and functions, restoring wetlands and controlling exotic pest species conserves ecosystem diversity. Also, considering actions effects on Fort Riley's terrain within the context of the fort as a part of the Flint Hills physiographic region conserves landscape diversity. Finally, the inventorying and monitoring species and their functions provide the feedback to adjust specific practices to meet these conservation benchmarks.

1.2. Goals

Fort Riley embraces DoD, Army, and FORSCOM policy to appropriately manage its natural resources and has identified the most cost effective stewardship to sustain the environment as a "Key Support Process" critical to meeting the Fort's mission and vision (Fort Riley Organizational Self-Assessment, 2000). This Integrated Natural Resources Management Plan (INRMP) is the foundation upon which the fort's natural resources management program is built. It is consistent with Army Memorandum, *Army Goals and Implementing Guidance for Natural Resources Planning Level Surveys (PLS) and Integrated Natural Resources Management Plan (INRMP)* (U.S. Dept. of Army, 1997).

This INRMP provides:

- An analysis of natural resource management functions and requirements, so they can be integrated into the fort's mission.
- Historical background, natural resource database, and programmatic information for managers and decision-makers at all levels to manage and use renewable resources.
- Specific resource management guidance.

1.2.1. Natural Resources Stewardship

The stewardship goal of Fort Riley's natural resources management program is to maintain ecosystem health and integrity while providing for military training and quality of life of the installation's personnel and others. We anticipate that achieving that goal will effect no more than relatively minor changes in the proportional representation and general distribution of vegetation communities and their associated fauna. General strategies to accomplish the stewardship goal follow:

- Apply an ecosystem management approach, as feasible, to integrate planning of various natural resources management programs.
- Practice adaptive management to review and revise management practices.
- Practice sustained yield in consumption of natural resources.
- Consider human dimensions in natural resources management planning.
- Provide professional conservation law enforcement.
- Involve community stakeholders in management planning and decision-making.
- Ensure natural resources conservation activities are coordinated with other installation activities and other resource management agencies.

1.2.2. Training and Operational Readiness

Training and operational readiness is the Fort's key process supporting military units (Fort Riley Organizational Self-Assessment, 2000), and a critical responsibility of the fort is to provide training lands upon which its units can develop their warfighting skills. Effective natural resources management ensures the long-term sustainability of those training lands.

Natural resources management at Fort Riley achieves the following goals:

- Ensures no net loss in the capability of installation lands to support current and future military training at Fort Riley.
- Monitors quality and status of training lands
- Minimizes impediments to training, mitigates effects of training on natural resources, and rehabilitates training lands.

1.2.3. Quality of Life

Quality of Life is the fort's key process supporting soldiers and family members (Fort Riley Organizational Self-Assessment, 2000). Hunting, angling, fuelwood cutting, and non-consumptive recreation such as bird watching are among the natural resource-based recreational activities pursued on Fort Riley. In fact, one of the four priority issues identified in the Fort's Family Action Plan is to provide hunting and other outdoor recreation. To meet the Fort's "Commander's Intent" (Fort Riley Strategic Planning Office, 2000) to continuously improve the quality of life for our soldiers and families, natural resource management activities will:

- Provide optimal opportunity for the majority of users for hunting, angling, and fuelwood cutting within biological-carrying capacities of the resource, taking into account human dimensions, safety, and the military training mission.

- Restrict opportunities, when appropriate, to provide high quality recreation in specific instances.

- Establish non-consumptive uses as an important priority in natural resources management.

1.3. Compliance Requirements

This INRMP and specific management programs must comply with a myriad of Federal and state laws and regulations, Executive Orders and DoD and Army regulations. A list of the Federal laws and Executive Orders governing natural resources management on military lands is in Appendix A.

1.4. Monitoring Progress

The Directorate of Environment & Safety will assess this INRMP at least annually to determine whether it remains an effective document governing all natural resources management activities. It will be modified, as required, to ensure that it does. All plans supplementing this INRMP, such as annual work plans and long-range, resource-specific plans, will conform to INRMP guidelines.

Metrics exist to measure the effectiveness and progress toward full implementation of this INRMP within Command reporting and information avenues. These include such reports to higher headquarters as the Environmental Quality Report and Installation Status Report, as well as discussions during quarterly video-teleconferences with FORSCOM personnel. At the installation level, the Environmental Quality Control Committee, staff action summaries, significant activity reports, installation action plans, Quarterly Status Briefs, and the installation-wide Organizational Self-Assessment provide progress and effectiveness evaluation. At the activity level, weekly staff meetings provide the opportunity for structured interaction between staff elements (within and between Divisions) to ensure that all activities are compatible with the tenets of the INRMP.

The DES, Conservation Division, as part of a strategic planning effort by the Directorate of Environment and Safety and the Fort, has prepared strategic plans for critical activities within the INRMP. Consequently, implementation progress is assessable through regular monitoring of the metrics within these strategic plans.

2.0 LOCATION AND ACREAGE

The following sections describe the location, size and history of Fort Riley.

2.1. Location

Fort Riley is a military defense installation located in Geary, Riley, and Clay counties of northeastern Kansas (Exhibit 2.1 below). It is approximately 135 miles west of Kansas City and 130 miles north-northeast of Wichita.

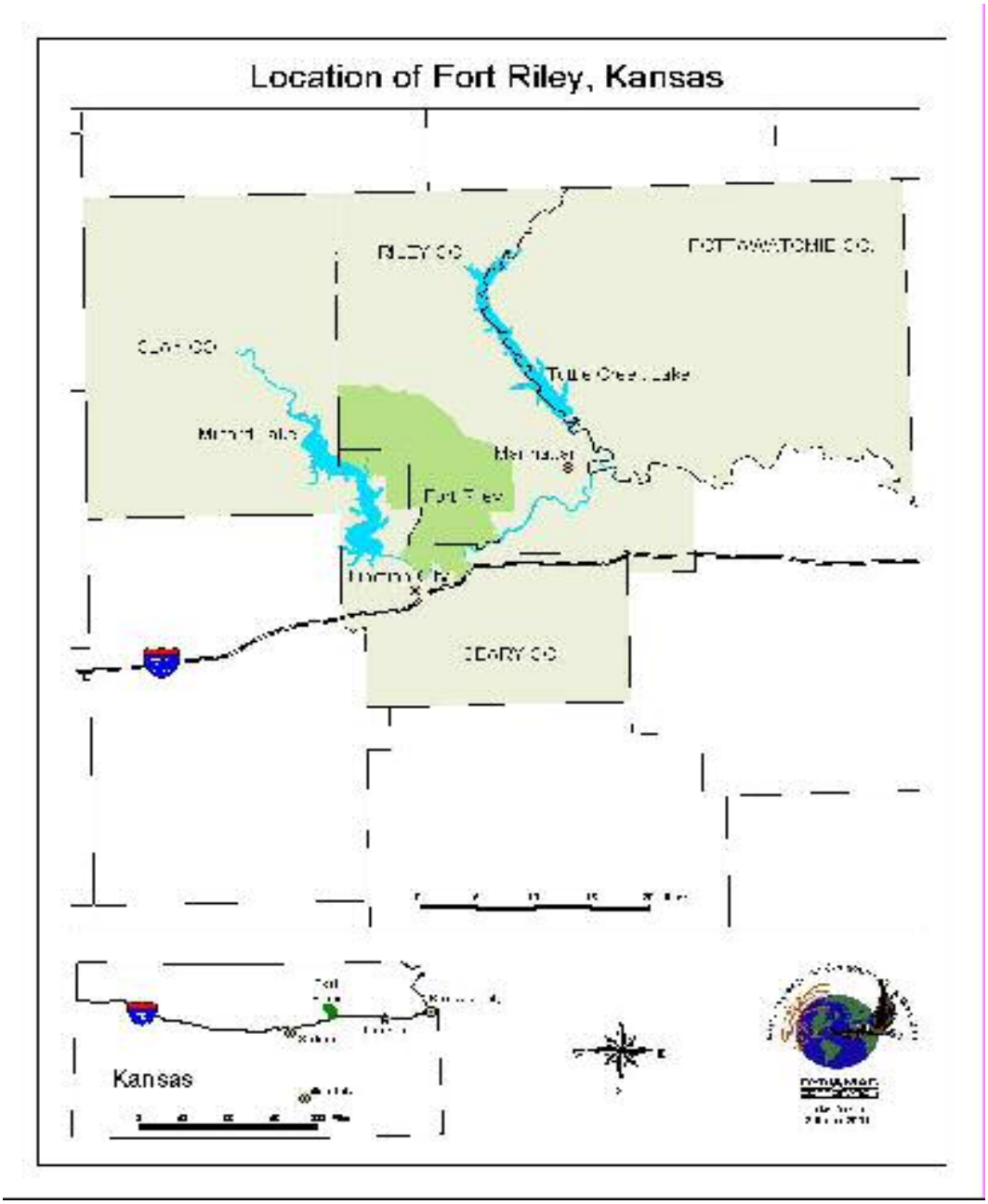

Exhibit 2.1

2.2. Acreage and Acquisition

Fort Riley comprises 100,656 acres of land after two expansions. The first occurred in 1942 with the purchase of a 31,720-acre addition and the second major expansion occurred in 1966-1967 with the purchase of another 46,065 acres.

2.3. Installation History

Fort Riley was established in 1853 as a temporary camp at the confluence of the Smokey Hill and Republican rivers. It was initially called "Camp Center" because it was believed to be near the geographical center of the United States. In 1853, Camp Center was garrisoned by the 6th Infantry Division, which was assigned the mission of protecting westward moving pioneers on the Santa Fe Trail. Also in 1853, Congress appropriated funds to construct a new post on the site, and the installation was renamed "Fort Riley" in honor of Maj. Gen. Bennett Riley. Construction of permanent facilities began, and the installation's boundaries, surrounding 23,899 acres, were established in 1855. In 1867, the installation was reduced to 19,899 acres.

The most famous unit to serve on Fort Riley during its early period was the 7th Cavalry Regiment that arrived on post in 1866 and remained until 1876. The second in command of the regiment was Lieutenant Colonel George A. Custer, who later commanded the 7th Cavalry in the Battle of the Little Big Horn in 1876.

Construction of many new facilities occurred during the 1880s and early 1890s. Furthermore, Fort Riley became the home of the Army's Cavalry and Light Artillery Schools in 1893 (combined into the Mounted Service School in 1907) with the mission to provide instruction in advanced military training.

The post experienced a tremendous expansion of facilities during World War I. First, Camp Funston was constructed in 1917 and became the largest semi-permanent training camp in the country, with a capacity for 50,000 troops. The facility was torn down after the war. The mission of the Mounted Service School changed in 1919 to encompass the training of officers and enlisted men in the techniques and tactics of cavalry, to the exclusion of artillery instruction. Subsequently, the name was changed at this time to the Cavalry School. Marshall Army Airfield (MAAF) opened in 1921. It was named Marshall Field in 1923 in honor of Colonel Francis C. Marshall.

Activity increased at Fort Riley during World War II. The Cavalry Replacement Training Center was established in 1942 at the present-day location of Camp Forsyth. The center trained 150,000 men until its closing in 1946. An officer training program providing courses in mechanized warfare was added to the Cavalry School. Also during this period, Camp Whitside was built, and Camp Funston was rebuilt.

The Cavalry School was deactivated in 1946 when all horse units in the Army were replaced by mechanized Cavalry and Armor units. The 10th Army Training Division occupied Camp Funston beginning in 1948 and later trained troops for the Korean Conflict.

Operation Gyroscope saw the exchange of the 10th Division with the 1st Infantry Division in 1955. The 1st Infantry Division, known as the "Big Red One," was headquartered at the installation until 1966-1967 when it was deployed to Vietnam. The 1st returned in 1970. The 1st was deployed to Operation Desert Shield/Storm in 1990/1991.

Significant restructuring of the Army began in 1996. The 1st Infantry Division's Headquarters and many of its other elements were forward deployed to Germany. The 1st Brigade of the 1st Infantry Division remained at Fort Riley and later was joined by the 3rd Brigade of the 1st Armored Division. Most recently, the 24th Infantry Division headquarters was moved to Fort Riley in June, 1999 to consolidate Active components and Reserve components into one Division.

2.4. Neighbors

Manhattan (population 45,000) is located three miles east of the post's northeast corner. Junction City (population 27,000) is located adjacent to the southwestern boundary of the installation and other smaller communities surround the installation. These include Riley (population 900), Wakefield (population 1,000), and Ogden (population 1,300). Most land proximate to the installation is farm ground. The most likely significant adverse impact of Fort Riley operations on neighbors' lands is that wild fires generated in training areas can potentially leave the installation and burn private property. This potential impact is addressed by leasing firebreak crop fields to local farmers (Section 8.3). A second impact is that military vehicles occasionally stray off the installation onto adjacent privately-owned lands. Incidents of off-target weapons fire affecting private property are extremely rare.

3.0 MILITARY MISSION

This next section details the relationship between natural resources and mission activities. Military field training occurs within 100 designated training areas. Seventy-six of these are combined into 17 larger Maneuver Areas north Vinton School Road. Exhibit 3.1 on the next page shows the Maneuver Areas and the Training Areas.

3.1. Overview

Fort Riley is a permanent U.S. Army FORSCOM installation with the primary mission to provide training, facilities, housing, and support to the 24th Infantry Division (Mechanized). Typical training operations, which occur throughout the year on a daily basis at Fort Riley, involve field maneuvers, combat vehicle operations, mortar and artillery fire, small arms fire, and aircraft (primarily helicopter) flights.

Fort Riley supports a population of more than 25,000 individuals comprising 10,057 soldiers, 11,699 family members (13,052 soldiers and family members live on post) and 3,606 civilian employees (FY 00). Another 16,365 (retirees) are dependent on Fort Riley services. Fort Riley tactical equipment assets in FY00 included 176 M1 Main Battle Tanks, 108 Bradley Fighting Vehicles, 580 other tracked vehicles, more than 3,600 wheeled vehicles, and 15 rotary-wing aircraft. There are 21 ranges available on Fort Riley for training in weapons use.

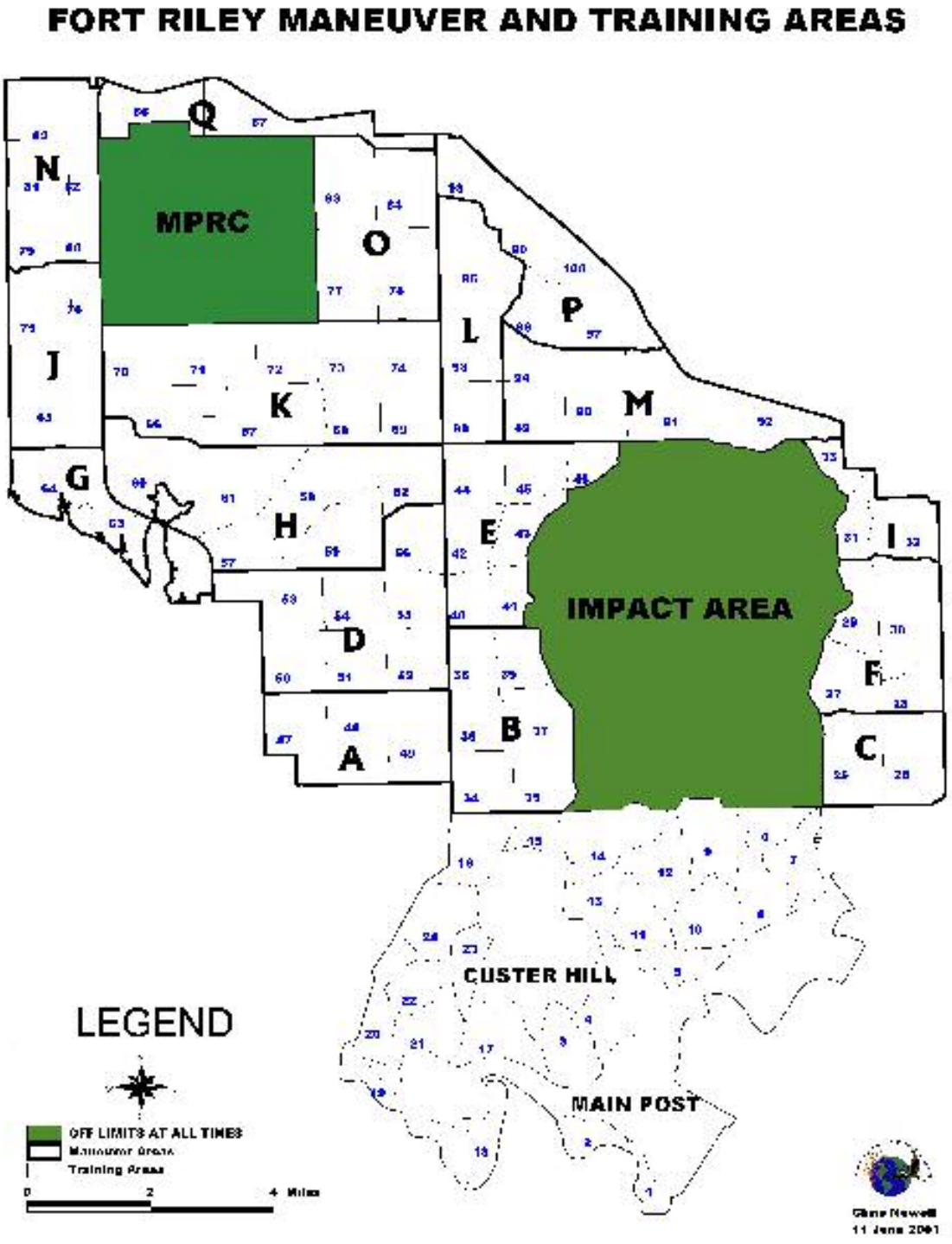
FORT RILEY MANEUVER AND TRAINING AREAS
MPRC
IMPACT AREA
CUSTER HILL
MAIN POST
LEGEND
OFF LIMITS AT ALL TIMES
Maneuver Areas
Training Areas
0
2
4 Miles

Exhibit 3.1

3.1.1. Headquarters, Fort Riley

MISSION STATEMENT

Fort Riley provides training, readiness, and deployment support for two Brigade Combat Teams and one Engineer Group; serves as higher headquarters providing Training/Readiness Oversight, pre- and post-mobilization training and mobilization validation for three enhanced Separate Brigades; provides planning, mobilization, validation and demobilization for AC and RC units and individuals; and provides exemplary well-being for life for soldiers, civilians and their families (Fort Riley Strategic Planning Office, 2001).

3.1.2. Ongoing Mission Activities

Wide ranges of activities occur on a regular basis at Fort Riley to conduct and support the Fort's assigned training mission. Many "ongoing activities" are essentially public works and commercial service functions required to allow people to live and work on the installation. Many of these activities are similar to those conducted in any non-military community of equal size, and include the following types:
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- Administrative operations;
- Airfield operations;
- Facilities repair, maintenance, construction, and alteration;
- Fuel and petroleum storage and dispensing;
- Grounds maintenance;
- Hospital, medical, and dental clinic operations;
- Installation and community support services;
- Natural and cultural resources management and environmental protection;
- Recreation;
- Road and right-of-way maintenance;
- Utility operations including infrastructure maintenance, repair, construction, and alteration;
- Warehousing and supply storage; and
- Vehicle and equipment maintenance and repair.

3.1.2.1. Training Activities

Training activities typically scheduled each year include the following.

- **Multi-Purpose Range Complex (Douthit Range) gunnery exercises**. Multi-Purpose Range Complex (MPRC) gunnery exercises are typically scheduled six times annually at Douthit Range. Each unit has up to 58 combat vehicles (M1 or M2) firing throughout the gunnery exercise. Battalions use approximately 58 square miles (145 square kilometers) of training area that includes the MPRC impact area and the western strip training area. MPRC gunnery exercises are live-fire training events.
- **Multi-Purpose Range Complex (Range 18) gunnery exercises.** MPRC gunnery exercises at Range 18 are typically scheduled seven times annually. Each unit has up to 58 combat vehicles (M1 or M2) firing throughout the gunnery exercise. Battalions use approximately 28 square miles (70 square kilometers) of training area during MPRC gunnery exercise training at Range 18 (including the impact area and training areas 6 through 9). Range 18 gunnery exercises are live-fire training events.
- **Brigade Battle Simulation Exercises.** Brigade Battle Simulation Exercises are typically scheduled six times annually. The simulated battles are conducted on computers inside the battle simulation center, and information is passed back and forth between the subordinated commanders and tactical operation centers. Brigades use approximately 1.6 square miles (4 square kilometers) of training area during a Brigade Battle Simulation Exercise. Brigade Battle Simulation Exercises are conducted without ammunition.
- **Company/Team Situational Training Exercise.** Company/Team Situational Training Exercises are typically scheduled twice annually. These exercises are conducted to prepare the subordinate units within the brigade, which is scheduled to conduct a National Training Center rotation. A brigade may have up to 174 combat vehicles (M1 or M2), along with its combat support units, maneuvering throughout the training area during the exercise. Thus, brigades use approximately 40 square miles (100 square kilometers) of maneuver training area during Company/Team Situational Training Exercises. Company/Team Situational Training Exercises are blank-fire training events.
- **Field Artillery External Evaluation.** Field Artillery External Evaluations are typically scheduled twice each year. During these Evaluations, Field Artillery battalions evaluate their M109 howitzer crews, fire direction centers, and forward observers on Artillery tables and call for fire procedures. Field Artillery battalions may have up to 24 M109 howitzers firing throughout the exercise. Battalions use approximately 44 square miles (110 square kilometers) of training area during Field Artillery External Evaluations (including the impact area and training areas 5 through 16). Field Artillery External Evaluations are live-fire training exercises.

- **Engineer/Field Artillery MPRC and Range 18 gunnery training.** Douthit and Range 18 gunnery-training exercises are typically scheduled six times for Engineer/Field Artillery use each year. Engineer and Field Artillery battalions qualify their combat vehicle crews on the 50 caliber machine gun tables. Each unit has up to 34 combat vehicles (M113 or M109) firing throughout the gunnery training. Battalions use approximately 28 square miles (70 square kilometers) of training area during Range 18 gunnery training, including the impact area and training areas 6 through 9. During MPRC gunnery training battalions use approximately 58 square miles (145 square kilometers) of training area, including the MPRC impact area and the western strip training areas. MPRC and Range 18 gunnery training exercises are live-fire training events.
- **Annual Training (AT).** Only one annual training period is scheduled during most years. During an annual training period, a brigade-sized National Guard unit uses all of Fort Riley's training areas and ranges. So, a National Guard brigade may have up to 174 combat vehicles (M1 or M2), along with its combat support units, maneuvering throughout Fort Riley training areas. AT periods use approximately 126 square miles (315 square kilometers) of training area, including both of the impact areas. AT periods are both live-fire and blank-fire training events.
- **Expert Infantryman's Badge and Expert Field Medical Badge training events.** Expert Infantryman's Badge and Expert Field Medical Badge training events are each typically scheduled once a year. Infantry and medical soldiers participate in the training and testing of common tasks expected of each. Combat vehicles (M1 or M2) are not used to support either event. Both events require approximately 1.6 square miles (4 square kilometers) of training area. Soldiers participating in both events are required to qualify expert with their individual weapon prior to the training event. Both training events are conducted with a small amount of blank ammunition.
- **Platoon Situational Training Exercises.** Each battalion conducts Platoon Situational Training Exercises to prepare for Company/Team Situational Training Exercises (which, as discussed above, are typically scheduled twice each year). Platoon Situational Training Exercises last typically three weeks and precede each Company/Team Situational Training Exercise. A battalion may have up to 58 combat vehicles (M1 or M2) maneuvering throughout the training area during the exercise. Battalions use approximately 18 square miles (45 square kilometers) of maneuver training area during Platoon Situational Training Exercises. Platoon Situational Training Exercises are blank-fire training events.

3.2. Natural Resources Needed to Support the Military Mission

Much of Fort Riley is flat, open topography and lends itself to force-on-force maneuver training. Deep loamy, clay soils in these flats are not particularly susceptible to erosion as shown by the Universal Soil Loss Equation model (USLE). Tallgrass prairie and woodlands provide durable ground cover and areas for tactical concealment.

3.3. Effects of the Military Mission on Natural Resources

Military training involves three major activities: construction of facilities, maneuver activities, and ordnance explosions. This discussion focuses on the latter two with particular emphasis on maneuver activities because construction of facilities primarily occurs within Cantonment Areas and seldom impacts native, high-quality habitats. Maneuver activities impacts primarily occur on, and parallel to, tank trails according to an evaluation of soil and vegetation impacts conducted in 1991 by the U.S. Army Construction Engineering Research Laboratories (CERL). The highest frequency of such disturbance occurs along trails leading to the MPRC. Therefore, the highest concentration of off-road disturbance by tracked vehicles is within the MPRC, and maneuver areas E, H, L, K, O and north half of D, and the western portions of M and P (CERL, 1991). Ordnance explosions are restricted to the 16, 000 acre Impact Area that is an unmanaged parcel of land.

Efforts by the DES, Conservation Division, and others involved in managing, repair and mitigation of impacts to training lands are described in Section 8.0, *Natural Resources Management*. The primary program for managing training lands and ensuring long-term compatibility of the training mission with natural resources is the Integrated Training Lands Management (ITAM) Program. The ITAM program is described in detail in Section 8.13, *Training Lands Management*.

3.3.1. Soil

Soil impacts primarily result from off-road vehicle movements and explosive ordnance detonations. These impacts include soil erosion and compaction. The areas affected by soil erosion and compaction include the Maneuver and Training Areas, as well as the Impact Area. However, according to investigations conducted by CERL; (1991), wind erosion is almost nonexistent on Fort Riley, and, except for a few instances, severe erosion from water is limited.

3.3.1.1. Maneuver Training

The off-road movements of both tracked and wheeled vehicles can compact lower soil horizons, loosen upper soil layers, disrupt root mats, and remove vegetative cover. Loss of vegetative cover also occurs as a result of accidental fires caused by training activities. Such losses expose the soil surface to wind and direct precipitation impact. The severity of the effects of any of these activities varies depending upon the soil type, depth to bedrock, degree of disturbance to vegetative cover, rainfall, and season of occurrence.

The repeated crossing of streams at the same non-hardened location creates areas with gully erosion along sloped approaches, destabilized streambanks, and deeply cut stream channels. In addition, as the original crossing becomes less passable, the damage can be spread laterally as vehicles attempt to by-pass the disturbed site.

3.3.1.2. Ordnance Explosions

Soils are affected in the Impact Area (detonation zone), by both non-explosive rounds and explosive rounds. Erosion may be high at the locations of ordnance impact because fires are frequently generated by the impact. Further, the explosive force of live ordnance disturbs and exposes the soil surface as well as destroys protective vegetation cover and root mats. However, the danger posed by unexploded ordnance in the Impact Area means no action can be taken to monitor or control soil erosion there.

3.3.2. Water

The primary effects on water occur from soil erosion as a result of maneuver training activities, which are conducted in the Training Areas, and explosive ordnance detonation in the Impact Area. Increased rates of soil erosion at disturbed sites, have, at times, increased turbidity and sedimentation of some surface waters on the installation. Portions of streams, rivers, and lakes located off-post also may have been affected by increased turbidity.

3.3.3. Vegetation

Off-road vehicles cause the most notable impact on vegetation within the training areas of Fort Riley. In grasslands, these impacts include the following: the crushing and shearing of individual plants; the replacement of perennial grasses (such as big bluestem, Indian grass, little bluestem, and grama grasses) by early successional grasses and forbs such as curly dock, common mullein, tansy mustard, black medic, field bindweed, and various species of goldenrods and sunflowers; the mechanical disruption and breaking of root mats which allow the invasion of woody plants such as eastern red cedar, buckbrush, dogwood, American elm, and hackberry; and the compaction of soil which hinders seed germination (Goran et al., 1983). Established trees and shrubs are damaged by physical contact or through root damage. Soil compaction can also increase seedling mortality (Goran et al., 1983).

Winter fires may also affect the composition of grasslands by enabling growth of cool season grasses instead of native grasses. Other activities affecting vegetation on Firing Ranges are pesticide application and the periodic mowing and cutting of areas of vegetation to maintain lines-of-sight to targets. Also soil sterilant is used on specific small spots around the perimeter of each target mechanism on most Firing Ranges. The average area of soil sterilized around target mechanisms is 0.01 acres. The aggregate area of soil sterilant application is 16.4 acres. Finally, broad-leafed plant herbicides are applied to approximately 780 acres at Ranges 17, 18, and 19 within the Impact Area.

3.3.4. Fish and Wildlife

The military mission affects fish and wildlife on Fort Riley primarily through changes in habitat. Documented effects on habitats are vegetation disturbance and stripping, wild fire, and sedimentation into headwaters of streams. Direct effects on fish and wildlife can also occur. These include nest disturbance and mortality. For example, occasional collisions between military vehicles and deer and other mammals occur, primarily on the Fort's roads.

Maneuver training, in particular, removes vegetation and changes the composition and structure of the native floral community. Research has shown faunal communities on Fort Riley change as a result of changes in floral communities. According to Goran (1983), as disturbance by tracked vehicles increased at Fort Riley, small mammal communities changed in composition. For example, this analysis noted an increase in white-footed mice and a decrease in shrews, wood rats, voles, moles, chipmunks, and squirrels.

Wild fires in grasslands have resulted in almost complete removal of vegetation in relatively large expanses. For example, in 1999, winter and fall wild fires burned one block of at least 2,400 acres and three other blocks of at least 400 acres each. Winter and fall fires potentially are the most stressful on wildlife populations when food and cover are most critical for survival.

Quist (1999) attributed siltation in headwater reaches to disturbance within the watershed from military training activities. Fish species diversity increased when stream habitat was disturbed, and the fish community shifted from an assemblage of small, omnivorous species to large, piscivorous species. In particular, increased soil erosion and stream turbidity could adversely impact habitat for the Topeka shiner, a Federally-listed endangered minnow.

Notably, impacts tend to create a spatial and temporal mosaic of habitat conditions rather than installation-wide, permanent change. Habitat integrity on a landscape scale is maintained, but conditions and effects vary.

Abundant populations of wildlife exist on Fort Riley because of this landscape mosaic. Research and wildlife surveys suggest that overall biomass and diversity of the faunal community across the installation is unaffected by military training. The Goran research concluded that small mammal trapping did not indicate a decline in small mammal populations or small mammal biomass on impacted sites. Futhermore, research conducted on mammalian predators has shown that Fort Riley supports some of the highest populations reported in the scientific literature (Kamler, 1999).

Surveys of Henslow's sparrow populations by DES, Conservation Division found populations were comparable to Konza Prairie populations. Also, prairie-chicken lek surveys show stable populations that may be higher than surrounding Flint Hills pasture land. Other non-systematic observations of big game populations suggest that deer and turkey numbers are comparable or higher than those of surrounding lands. Furthermore, research conducted on the Henslow's sparrow and the loggerhead shrike (Michaels, 1997) found that habitat use by these two species was not connected to grassland disturbance from military training.

3.4. Effects of Natural Resources Management on the Mission

Fort Riley's natural resources support an aggressive military training mission. The generally rolling topography, covered by grasslands interspersed with streams and wooded areas, provides a variety of terrain types that are useful for both mounted and dismounted training activities. A recent installation commander, MG (then) Randolph House, remarked to staff that Fort Riley's vegetative types and terrain are ideally mixed to provide a superb training site.

Natural resource concerns at Fort Riley impose minor controls on training. Most of these controls involve protecting areas leased for agricultural production, wetlands, and threatened and endangered species. However, these controls do not impose substantive adverse impacts on the military mission. Most, if not all, limits can be easily met through prior planning of the mission.

Land is leased around the installation's perimeter for crop production, primarily to provide a system of firebreaks for the fort. That leased ground comprises about 1% of the fort, and military training is prohibited in those cropfields. Wetlands are another minor (also approximately 1%) component. The wetlands are generally small and dispersed. Except for crossing streams, soldiers generally avoid wetlands during maneuver activities because wetlands don't lend themselves to vehicle movements.

Mission restrictions pertaining to Federally-listed threatened and endangered species are minimal due to the lack of interface between the species and the mission. For example, three of the four listed species on the fort are birds that use riverine habitat, located along the boundary of the installation in which little training occurs. Furthermore, two of these three are uncommon transients that move through the area only during migration periods, and one of them is proposed for Federal delisting (bald eagle). State protection of its habitat will, nevertheless, still apply.

Bald eagle critical habitat on the fort is not Federally-designated, but it is State-designated along the southern boundary formed by the Kansas and Republican Rivers. Most threatened and endangered species habitat on the installation is stream and riverine riparian. These areas do not lend themselves well to mechanized training; thus impact by, and to, military training is limited.

Fort Riley's Endangered Species Management Plan (ESMP) (Appendix E) supports the military mission while ensuring compliance with Federal and state laws and regulations protecting threatened and endangered species and their habitats. The primary protective measure prescribed by the ESMP is the establishment of buffer zones around habitat. Additionally, the ESMP requires review of all planned activities that could potentially affect threatened and endangered species or their habitats. The two species most likely to interface with the mission are the Topeka shiner and the bald eagle.

3.5. Future Military Mission Impacts on Natural Resources

It is not anticipated that the mission at Fort Riley will change substantially during this five-year plan. In fact, we expect mission impact on natural resources to remain similar to those of today. Most impacts are anticipated to be the result of off-road vehicle maneuvering.

Restationing significant rotary wing aviation assets at Fort Riley is a potential addition to the mission. Aviation training of various types (Air Cavalry, Medevac, etc.) has occurred on the installation in the past, with no significant impact on the installation's natural resources. Therefore, we would expect no significant impacts to the natural resources were similar missions to recur. However, the current requirement to protect bald eagles from disturbance could constrain aviation training significantly. The Notice to Airmen (NOTAM) system is the mechanism used to inform aircrews of necessary restrictions.

All mission changes, including fielding of new equipment, will be analyzed under the NEPA process, where applicable. Any mission changes will then consider natural resources planning parameters such as protection of threatened and endangered species.

4.0 FACILITIES

The information in Section 4.0 is from *The Programmatic Environmental Assessment for the Real Property Master Plan and Ongoing Mission Fort Riley, Kansas* (Parsons, Harland Bartholomew and Associates, Inc., 2001).

4.1. Overview

Facilities associated with a major city as well as specialized aspects for military training are present on Fort Riley. This is because numerous buildings (1,847 buildings with a total of 13,745,550 square feet), energy and water utilities, waste handling systems, and communications and transportation networks (389 miles of roads and railroad track) are required to support the military mission.

4.2. Transportation System

The transportation system comprises roadways, railways, and airfields.

4.2.1. Roadways

Fort Riley has approximately 241 miles of paved roads and 124 miles of maintained tank trails (gravel roads) on the installation. In addition, to maintain tank trails, the installation's training areas are threaded with a vast network of dirt roads and trails. Also, Fort Riley is served by an extensive, well-maintained, off-post, roadway system. In particular, Interstate 70, which is located adjacent to the Fort's south boundary, is the major east-west arterial within central Kansas and the Fort Riley region. Seven principal roadways access the installation:

- Grant Avenue (in Junction City);

- Camp Funston (a "back door" entrance from K18);
- Kansas Highway 18 (at West Huebner);
- Henry Drive (Exit 301 off I-10 at Marshall Army Airfield);
- Trooper Drive (at Washington Street in Junction City);
- Range Road (at old Highway 11 on the western side of installation); and
- Estes Road (at old Highway 11 on the western side of installation).

4.2.2. Railways

The Union Pacific Railway passes through the southern portion of Fort Riley, and connects the Strategic Rail Corridor Network line to Topeka, Kansas. Further, Fort Riley has 12 miles of track located in three areas: Camp Funston, Camp Whitside, and Main Post. The government owns the track on the installation, with the exception of the main line, which is owned by the Union Pacific Railroad.

Camp Funston is the primary location for rail loading activities. This area contains adequate open land for staging, new dock facilities, good rail access, and night lighting for 24-hour operations. The Camp Funston area also has a rail car capacity of 340 cars.

4.2.3. Airfields

Marshall Army Airfield (MAAF) is Fort Riley's on-post airfield. It consists of a 4,400-foot long runway (140 feet wide), 40-foot wide taxiways, and 48,000 square yards of parking aprons. The MAAF serves 15 UH-1 helicopters that are used for medical evacuation flight training and fly no set schedules. Also, Manhattan Regional Airport provides regular airline service to the Fort Riley region.

4.3. Water Supply

Groundwater is the water source for domestic and industrial use at Fort Riley. Two well fields, located in Colyer Manor and Camp Forsyth, contain eight wells ranging in approximate depth from 60 to 80 feet. Individual well capacities range from 400 to 1,000 gallons per minute (gpm). The total pumping capacity from these wells is 1,400 gpm or 10.8 million gallons per day (MGD). The groundwater is withdrawn from aquifers recharged by the Republican and Kansas Rivers. Water for wildlife needs is provided by precipitation runoff and collects in the installation's wetlands.

4.4. Wastewater

Most sanitary sewage is collected in approximately 80 miles of collection sewers ranging in size from 6 to 24 inches in diameter. Several small, isolated facilities on Custer Hill and in the range areas use separate independent waste water systems. Three wastewater treatment plants (WWTPs) provide sanitary sewage treatment at Fort Riley. The plants

are located at Custer Hill, Main Post, and Camp Forsyth. Plans are being developed to upgraded the current Custer Hill Plant to consolidate the three plants into a single more efficient operation. The upgrade is to begin in FY2002.

WWTP sludge is transferred using internal and underground piping to drying bed sites located at or near each WWTP. After transfer to the drying beds, sludge is stored in the drying beds for three months to two years. The stored, dried sludge is then applied to a Fort Riley hay lease area every one to two years. Effluent from the Main Post WWTP feeds directly into the Kansas River; effluent from the Camp Forsyth WWTP discharges into the Republican River, which then joins the Kansas River; effluent from the Custer Hill WWTP discharges into Three Mile Creek, which empties into the Kansas River. All effluents are sampled and discharged in accordance with National Pollutant Discharge Elimination System (NPDES) Permit # F-KS97-PO01.

Industrial wastewater is generated in the tactical equipment shops (TESs) and vehicle washracks on Custer Hill. Wastewater from these operations undergoes oil/water separation and sediment settling in one of three TES sedimentation basins on Custer Hill. After passing through the sedimentation basins, the water drains into the Central Vehicle Wash Facility (CVWF) lagoon system, where it is eventually recycled for exterior vehicle cleaning at the CVWF.

4.5. Solid Waste Disposal

Solid waste generated at Fort Riley is primarily municipal waste and demolition debris. Municipal waste, as required by the State of Kansas, is removed from Fort Riley by a contracted waste hauler. The waste is first taken to the Riley County Transfer Station in Manhattan. From there, it goes to the Jefferson/Douglas County Landfill near Perry, KS.

A curbside recycling program for collecting yard waste, aluminum, glass, paper, plastic, and steel has been instituted in all housing areas. Whereby, a private contractor collects the material. Fort Riley also has a paper and cardboard recycling program. Yard wastes such as leaves and grass clippings from the installation are processed at the Fort Riley compost facility.

A new C/D landfill opened in late-2000 at an abandoned quarry on Campbell Hill. The one previous landfill at Fort Riley, located northeast of Camp Whitside, was approximately 34 acres in size and was used only for construction/demolition (CD) debris and asbestos, not municipal waste. The old landfill is slated for closure in 2001. The estimated quantity disposed of at the C/D landfill is approximately 42,000 tons per year.

5.0 RESPONSIBLE AND INTERESTED PARTIES

Full implementation of this INRMP requires collaboration and coordination with many internal and external stakeholders. For example, day-to-day operations require extensive coordination within the installation. Meanwhile, external stakeholders provide policy input, technical and logistical assistance and review of operations. In fact, stakeholders

have been integral to the natural resources management program since its inception at Fort Riley.

5.1. Primary Installation Personnel and Organizations

This section identifies thirteen organizations concerned with conservation and use of natural resources.

5.1.1. Commanding General

The Commanding General (CG) of Fort Riley is directly responsible for overall mission accomplishment at Fort Riley. This responsibility includes implementing the INRMP and all other applicable natural resources plans. The DES, Conservation Division, through the Director of Environment and Safety, the Garrison Commander, and Chief of Staff, advises the Commanding General on natural and cultural resources issues.

5.1.2. Chief of Staff

The Chief of Staff is responsible for military training on Fort Riley. This responsibility is discharged via the G3/Directorate of Plans, Training and Mobilization (DPTM). The Director of that organization is responsible for implementing the ITAM program.

5.1.3. Garrison Commander

The Garrison Commander (GC) is responsible for land and facilities at Fort Riley. The GC is the first military staff member in the chain of command of the Fort's natural resources managers.

5.1.4. Directorate of Environment and Safety

The Directorate of Environment and Safety (DES) is responsible ultimately to develop, execute, and administer all environmental and safety programs and projects. The DES Vision, Mission Statement, and Goals reflect dedication to environmental stewardship.

- **VISION.** *To provide the Directorate of Environment and Safety customers with the best compliance, restoration, prevention, conservation and safety service available within the Department of the Army.*

- **MISSION STATEMENT.** *To protect life, property and natural resources for use today and in the future by integrating environment and safety programs with the mission of Fort Riley.*

- **GOALS.** *To protect the worker and the environment of Fort Riley, provide a safe atmosphere for all and conserve all its natural and cultural resources through proactive means.*

5.1.4.1. Conservation Division

The DES, Conservation Division is responsible for the management of natural and cultural resources on Fort Riley. The mission statement of the DES, Conservation

Division is "to protect and conserve the installation's natural and cultural resources to provide a safe and realistic training environment for the military mission, allow the use of renewable natural resources in an environmentally sound manner, and protect natural and cultural resources to ensure compliance with Federal laws."

One of the central functions of natural resources management is the development and implementation of this INRMP pursuant to AR 200-3 and the Sikes Act Improvement Act of 1997. Accordingly, programs are developed and implemented to ensure that natural and cultural resources are conserved and enhanced for future generations. Thus the DES, Conservation Division will continue its liaison with state and Federal agencies concerning natural and cultural resources to meet these objectives.

5.1.4.2. Other DES Divisions

Four other divisions are under DES: Operations and Management, Pollution Prevention, Safety, and Recycle and Solid Waste Divisions. Although each of these divisions has its own specific missions, they are integrated with one another and with the DES, Conservation Division to provide a comprehensive environmental management and protection program for the Installation Commander. For example, Installation Safety Division provides input about hunting safety and the military mission. Pollution Prevention Division is notified of fish kills to determine if water quality issues require investigation and assists in disposal of expired shelf-life pesticides. The Recycle and Solid Waste Division provides compost to augment soil at wildlife food plots. DES, Conservation Division personnel often provide advice and assistance to other divisions as well, for instance regarding the Installation Restoration Program (Operations and Management Division) on reseeding closed landfills. Such interactions are routine within the DES.

5.1.5. Directorate of Community Activities

The Outdoor Recreation Branch of the Directorate of Community Activities (DCA), in cooperation with the DES, Conservation Division is responsible for establishing, planning, and coordinating all recreational aspects of hunting and fishing at Fort Riley. DCA, Outdoor Recreation Center issues hunting, fishing, and fuelwood permits.

5.1.6. G3/Directorate of Plans, Training and Mobilization

This Directorate (the G3/DPTM) is a vital coordination and approval point in implementing this INRMP as well as in daily operations. G3/DPTM provides review during the decision-making process for such activities as implementing Fort Riley's Endangered Species Management Plans (ESMP), developing Environmental Assessments, and establishing firearms deer season dates. This activity provides information about planned military training missions for review relative to compliance with the ESMPs, Endangered Species Act, fielding of new equipment and permits for tactical digging. G3/DPTM is directly responsible, through its Range Branch, for implementing the ITAM program.

The Range Officer, within the Training Division, G3/DPTM, coordinates with the DES, Conservation Division concerning daily cultural and natural resources management activities. The Range Officer coordinates availability of areas and times of natural resources management activities. The Range Officer works with the DES, Conservation Division concerning access to training and maneuver areas by agricultural lessees and contractors and for prescribed burning. The Range Officer also provides the DES, Conservation Division with information concerning access by fishermen, hunters, fuelwood cutters, and non-consumptive users.

5.1.7. Staff Judge Advocate

The Staff Judge Advocate (SJA) plays a critical role in interpreting and enforcing natural and cultural resources laws and regulations. SJA provides legal opinions and guidance in interpreting Federal and State laws and Federal, State, Army, and Fort Riley regulations. SJA reviews and approves Fort Riley regulations that are promulgated to protect natural resources. SJA also reviews contracts and pertinent documents or actions requiring Command Decision or Approval/Signature. For example, this INRMP requires CG approval and thus was reviewed by SJA. One of the most important functions is to provide legal guidance about compliance with the Federal Endangered Species Act, the Kansas Non-Game and Endangered Species Conservation Act, and other applicable laws and regulations. The SJA also assists with prosecuting violators of installation, Kansas, and Federal statutes and regulations concerning natural and cultural resources protection.

5.1.8. Provost Marshal

The Provost Marshal's Office (PMO) is responsible for enforcing cultural and natural resources laws and regulations on Fort Riley including fish and game laws of the State of Kansas and the U.S. Government. PMO personnel performing game warden duties receive instruction on fish and game enforcement from the DES, Conservation Division. PMO game wardens also assist the DES, Conservation Division with deer check stations and other fish and wildlife management activities as described in AR 420-74 (AR 200-3).

A civilian Conservation Officer position was established in 1999. This individual is stationed at the PMO but shares work time between the DES and the PMO. A Memorandum of Understanding between PMO and DES (February, 2000) specifies the responsibilities and coordination requirements of the two Directorates for this position.

5.1.9. Public Affairs Office

The Public Affairs Office (PAO) helps disseminate information to soldiers, their families, and the general public about natural resources management and recreational opportunities on Fort Riley. PAO publishes a weekly DES article on natural resources topics entitled *On the Wildside* in the post newspaper, as well as other articles as requested. PAO coordinates media requests for interviews, including television and radio. Also, PAO makes requests to interview DES, Conservation Division personnel for the newspaper and to make appearances on the Fort Riley Cable Television Station. Last, PAO submits news releases to the civilian media regarding various natural resources management activities on Fort Riley.

5.1.10. Directorate of Public Works

The Directorate of Public Works (DPW) is the primary organization responsible for maintaining lands and facilities. DPW provides logistical, manpower, and equipment support to construct wildlife habitat projects. Examples of DPW support are the construction of gravel trails to fishing ponds, excavation and surveying of wetland construction projects, and range road construction and maintenance. Furthermore, DPW issues the installation's primary contract for pest control, which the DES coordinates and oversees. Also, Troop Construction Projects executed by military engineers are approved and processed by the DPW.

The DPW, Fire and Emergency Services Division, is responsible for controlling wildland fires, assisted, as required, by the DES, Conservation Division. The DES, Conservation Division develops annual prescribed burning plans in collaboration with the Fire and Emergency Services Division, DPW and Range Branch, DPTM. Each January, personnel from the three organizations meet to finalize that year's plans. Then, personnel in the Fire and Emergency Services Division, DPW and DES, Conservation Division implement the plans jointly.

5.1.11. Medical Department Activity

One of the Medical Department Activity (MEDDAC) functions is to prevent and control communicable diseases of wildlife on Fort Riley. DES, Conservation Division coordinates with MEDDAC, Preventive Medicine and Veterinary Services. Preventive Medicine Service conducts annual tick collections, seasonal mosquito surveys, stored-product pest surveillance in warehouses and commissary locations, cockroach control surveys in mess halls, screens for Lyme disease and human ehrlichiosis, and evaluates other disease transmission sources. Moreover, Veterinary Services supports collection of blood and tissue samples from various wildlife species to monitor parasite and disease occurrence. Veterinary Service also provides technical advice to DES, Conservation Division personnel regarding the epidemiology of diseases and their control. DES, Conservation Division and Preventive Medicine Service personnel jointly coordinate regular assessments of small mammal populations for hantavirus conducted by the Army's Center for Health Promotion and Preventive Medicine (CHPPM).

5.1.12. Military Units

Military units have provided manpower, equipment, and logistical support for a wide range of natural resources-related activities. For example, engineer support has been used to clear shrubby areas for planting wildlife food. Also, aircraft support has been provided for aerial wildlife surveys.

5.1.13. Environmental Quality Control Council

The Environmental Quality Control Council (EQCC) is a Commanding General-chaired council where environmental issues are discussed with the garrison and military command of Ft. Riley. The EQCC has approval authority for the Fort's Endangered Species Management Annual Activity Report. The EQCC meets quarterly.

5.2. Other Defense Organizations

This section describes the installation's cooperative work with five external Army activities.

5.2.1. U. S. Army Forces Command

Forces Command (FORSCOM) provides technical and monetary assistance to implement conservation programs per AR 200-3. FORSCOM has review and approval authority for this INRMP.

5.2.2. Army Environmental Center

The Army Environmental Center (AEC), a field-operating activity of the Army, is the central point of coordination of Army environmental programs, including conservation programs. AEC oversees, manages, and executes programs and projects. AEC also provides technical advice regarding pest management, endangered species, ITAM, and other related compliance areas. Finally, AEC coordinates the Army's participation in the Department of Energy's Oak Ridge Institute for Science and Education (ORISE) program (Section 5.3.2).

5.2.3. Corps of Engineers

The Corps of Engineers, Kansas City District assists Fort Riley by developing, executing, and administering contracts. It is also responsible for issuing permits to conduct activities such as road building that potentially wetlands in accordance with Section 404 of the Clean Water Act.

5.2.3.1. Kansas City District

The Corps of Engineers, Kansas City District has provided administrative support for sale of some standing timber on Fort Riley. The Corps of Engineers has administered three sales although most timber on Fort Riley is sold directly through installation contracts.

The Corps of Engineers, Kansas City District is responsible for administering leases for the Agricultural Outleasing program. Agricultural leases for hay harvest in training areas and the planting and harvest of cultivated crops in installation firebreaks are authorized this way.

The Corps of Engineers, Kansas City District has recently provided engineering, consultation, technical assistance, and liaison to the DES, Conservation Division. Within the past two years, the Corps of Engineers completed an Environmental Assessment for aerial application of herbicides, Environmental Baseline Studies (EBS) for agricultural leasing and design and construction of water inlet control structures for wetlands.

5.2.3.2. Waterways Experiment Station

The Corps of Engineers, Waterways Experiment Station (WES) provides general weed control information on request. An expert management software system (*Plant Management Information System*) was provided in 1996 for weed management decisions.

WES has assisted Fort Riley twice through the Conservation Assistance Program. WES provided designs and specifications of a water control inlet structure for wetlands created in 1995. Also, a biologist from WES assisted in establishing a protocol and training DES personnel to mist-net and identify bats in 1996.

5.2.3.3. Construction Engineering Research Laboratories

The Corps of Engineers Construction Engineering Research Laboratories (CERL) helped develop the ITAM program on Fort Riley. For example, CERL developed the protocol for biological data collection and analysis under the Land Condition Trend Analysis (LCTA) portion of ITAM. Further, CERL assisted in automating data storage, retrieval, and analysis as well as developing early GIS platforms. CERL also assisted the DES, Conservation Division in developing Tactical Concealment Sites to integrate the military mission with woodland rehabilitation.

5.2.4. Center for Health Promotion and Preventive Medicine

The U.S. Army Center for Health Promotion and Preventive Medicine (CHPPM) provides some assistance to the fort's natural resources management staff. For instance, CHPPM administers the Army's Military Entomology program, including research on, and surveillance for, hanta virus, and annual evaluation of mosquito populations, as well as periodic studies on cockroach resistance to pesticide. Most interaction with CHPPM occurs through MEDDAC's Preventive Medicine Service.

5.2.5. U.S. Army Medical Research Acquisition Activity

The U.S. Army Medical Research Acquisition Activity **(**AMRAA) helped develop the formal 1996 Conservation Partnership between the installation and Ducks Unlimited (DU). This Activity wrote and executed the agreement and also disbursed installation funding to DU for wetlands construction.

5.3. Federal Agencies

Other federal agencies include the U.S. Department of Agriculture, the U.S. Department of Energy and the U.S. Department of the Interior.

5.3.1. United States Department of Agriculture

This section covers U.S. Forest Service, the National Resource Conservation Service and the Animal-Plant Health Inspection Service.

5.3.1.1. U.S. Forest Service

The U. S. Forest Service (USFS) cooperates with DoD in the Forest Pest Suppression (FPS) program. Through that program, USFS entomologists and plant pathologists consult with installation personnel about potential damage from, and control efforts for, serious outbreaks of insects and disease in the Fort's woodlands and forests. Funds for the FPS program are provided directly from Congress to the USFS and are authorized for use on DoD properties. For example, Fort Riley cooperated in the initial stages of an FPS

project to study an outbreak of the walnut shoot moth (*Gretchena concitatricana*) in 1994.

The fort assists the USFS, North Central Research Station to complete 10-year State Forest Inventories. The DES, Conservation Division coordinates access to inventory plots on the fort by the Station's personnel. The results of the most recent inventory of Fort Riley plots were published in *An Analysis of the Forest Resources of Kansas, 1999, NC-334.*

5.3.1.2. Natural Resource Conservation Service

Periodically, the Natural Resource Conservation Service (NRCS) (formerly the Soil Conservation Service, SCS) has assisted the fort, both on an informal and a contract basis. For example, to comply with the Food Security Act of 1985 (FSA), the fort entered into an Interagency Agreement with the SCS in 1987. Under this agreement, SCS staff helped design and oversee construction of erosion control measures on Fort Riley's croplands. Compliance with the Food Security Act of 1985, and its reauthorization in 1990, was achieved in 1991 but work to establish erosion control measures on cropland not subject to the FSA continued under the agreement through 1995.

The agreement was revised in 1993 to incorporate work by the NRCS's Plant Material Center to support the ITAM program. This agreement, with subsequent modifications to enhance the support of the ITAM program, remains in force today. This allows Fort Riley to obtain services from the NRCS for a number of conservation activities. For example, the NRCS chose the site of, and designed three fishing ponds in 1995. Also in 1995, the NRCS assisted in identifying two areas for wetlands development.

5.3.1.3. Animał Plant Health Inspection Service (APHIS)

The Plant Protection and Quarantine Division (PPQ) of APHIS provides research, inspection, and funding to control and eradicate noxious and invasive weeds. In fact, Fort Riley serves as a member of the Kansas Biological Control Steering Committee. This committee advises PPQ on priorities for biological control research and recommends funding for projects that will assist landowners throughout Kansas, including the Army.

Fort Riley entered an Inter-Agency Agreement with APHIS-Wildlife Services in 1995 to control human-wildlife conflicts posed by a population of feral swine. This agreement is based on the DoD Memorandum of Understanding with APHIS (1990) to "establish procedures for planning, scheduling and conducting animal damage control activities, exclusive of routine vertebrate pest control operations on United States military installations…". Under the agreement, APHIS-Wildlife Services initially did part-time work for the fort. However, the role of APHIS was expanded in FY00, when that agency stationed a full-time employee at Fort Riley to provide nuisance wildlife control.

5.3.2. U.S. Department of Energy

The U. S. Department of Energy, Oak Ridge Institute for Science and Education (ORISE) helps manage natural resources on Fort Riley by providing research participants in forest, fisheries, and wildlife management. Participants are assigned an installation mentor to provide training and coordinate research project activities. Then, these participants help the fort determine future management by investigating and conducting detailed projects that the fort's personnel could not perform in the normal course of duties nor readily contract.

5.3.3. U.S. Department of the Interior

This section describes the cooperative the installation's cooperation with the U.S. Fish and Wildlife Service and U.S. Geological Survey.

5.3.3.1. U.S. Fish and Wildlife Service

Pursuant to a formal Cooperative Agreement (DES, 1994) superseded by this INRMP plan, the U. S. Fish and Wildlife Service (USFWS) Field Office in Manhattan, Kansas, provided technical assistance to the DES, Conservation Division, particularly regarding endangered species management on Fort Riley. Consequently, management recommendations have been integrated into Fort Riley's ESMP's. A biologist in the Partners for Wildlife Program contributed extensively to designing and constructing wetlands in 1998-1999. Fort Riley obtains rainbow trout from the USFWS Neosho National Fish Hatchery.

USFWS shares jurisdiction with Kansas Department of Wildlife and Parks pertaining to game and fish law enforcement. USFWS Special law enforcement agents have been involved with investigations of poaching on-post. They also have provided informal training to personnel from the Provost Marshal's Office. This shared jurisdiction will continue through the foreseeable future.

The USFWS is, in accordance with the Sikes Act Improvement Act of 1997, a signatory cooperator in implementation of this INRMP, which supersedes the *Cooperative Agreement for the Conservation and Development of Fish and Wildlife Resources on Fort Riley Military Reservation* (DES, 1994). Appendix B contains the 1994 agreement (and an amendment signed in 2000) among the USFWS, KDWP, and Fort Riley.

5.3.3.2. U.S. Geological Survey

The Biological Resources Division, U. S. Geological Survey, operates a Cooperative Fish and Wildlife Research Unit at Kansas State University. Thus, several research projects pertaining to natural resources management have been and are being conducted at the Research Unit. Section 10.1, *Research Mechanisms*, further elaborates specific research projects on Fort Riley natural resources management.

5.4. State Agencies

The three primary state agencies are Kansas Forest Service, Kansas Department of Agriculture, and Kansas Department of Wildlife and Parks.

5.4.1. Kansas Forest Service

The Kansas Forest Service provides seedlings for forest and wildlife habitat plantings at a nominal cost to the installation. On average, approximately 2,000 trees per year are purchased from the Kansas Forest Service that are from local seed sources and among the highest quality seedlings available. Insect and disease updates and general forest management information is given to the agency to assist in maintaining the fort's woodlands. The KFS surveys for invasive and exotic forest insect outbreaks in cooperation with APHIS, Plant, Protection and Quarantine Service, and Fort Riley cooperates with the agencies in surveying for pests of concern, such as gypsy moth and Japanese beetle. The Kansas Forest Service is the lead agency in Kansas for contacting and coordinating forest surveys on Federal lands.

The Kansas Forest Service is also the lead agency in Kansas for implementing the National Arbor Day Foundation's Tree City USA program and urban forestry programs sponsored by the USFS. Fort Riley has been recognized for its urban forestry accomplishments by being designated a "Tree City" for thirteen consecutive years. Fort Riley provides the Kansas Forest Service installation lands and assistance for agro-forestry and forestland reclamation genotype research.

5.4.2. Kansas Department of Agriculture

The Federal Noxious Weed Law requires that Federal agencies comply with all state laws governing the control of noxious weeds. The Plant Protection and Weed Control Division of the Kansas Department of Agriculture is responsible for implementing the state's noxious weed protection laws throughout Kansas, including Fort Riley. The State Noxious Weed Coordinator and local county noxious weed officers conduct periodic checks and inspections for noxious weeds and their control. The fort provides an annual report to the state on control efforts and surveys. An annual meeting each fall addresses efforts and plans for future control. Fort Riley has entered into two Memoranda of Understanding agreements that define compliance and relationship between the two agencies.

Fort Riley also cooperates with the State Board of Agriculture in surveillance and control of forest pests. Recent cooperation includes surveys for gypsy moth, Japanese beetles, and collection and identification of walnut stem defoliator.

5.4.3. Kansas Department of Wildlife and Parks

Pursuant to Cooperative Agreements, the Kansas Department of Wildlife and Parks (KDWP) furnishes technical assistance and advice on all aspects of the fort's fish and wildlife management program, including conservation education. The KDWP has provided labor and equipment for planting wildlife food plots during those years when sufficient Fort Riley labor was not available. The KDWP also provides various sport fish

at no cost to stock Fort Riley lakes and ponds. Consequently, Fort Riley has cooperated with the KDWP to reintroduce both wapiti (elk) and eastern wild turkey.

Kansas Department of Wildlife and Parks shares conservation law enforcement jurisdiction on-post with the U.S. Fish and Wildlife Service and the Provost Marshal's Office. KDWP frequently supports game and fish law enforcement during peak hunting seasons, particularly during firearms deer season. KDWP has investigated incidents of poaching on-post and off-post involving soldiers. KDWP issued a department radio for installation in the post's Conservation Officer's vehicle. KDWP sponsored the Conservation Officer at the Kansas Law Enforcement Training Center to receive basic law enforcement training. KDWP Officers have provided informal training to personnel with the PMO.

The KDWP is, in accordance with the Sikes Act Improvement Act of 1997, a signatory cooperator in implementation of this INRMP, which supersedes the *Cooperative Agreement for the Conservation and Development of Fish and Wildlife Resources on Fort Riley Military Reservation* (DES, 1994). Appendix B contains the 1994 agreement (and the 2000 amendment) among the USFWS, KDWP, and Fort Riley.

5.5. Universities

Kansas State University (KSU), Division of Biology, has had a long-standing relationship with Fort Riley to conduct natural resources research that began in 1961. Dr. Robert J. Robel's pioneering research on bobwhite quail food energetics was conducted on Fort Riley, beginning in 1961 and continued through 1977. In 1975, KSU conducted a northern pike research project at Moon Lake. Other projects have included an intensive white-tailed deer research project and non-game research focused on dicksissels and furbearer census development. A botanist from KSU, funded by Quail Unlimited, collaborated with the Fish and Wildlife Administrator to evaluate several alternative wildlife food plot crops. In addition, some natural resource inventories and surveys have been contracted to KSU by the installation to provide the expertise of university staff.

Fort Riley also uses the services of KSU in a variety of support activities. This includes the planning requirements for control of various pests, the Statistics Department to analyze hunting pressure and harvest data, and wildlife students for voluntary assistance at the Deer Check Station on occasion. The KSU Cooperative Extension Service also provides limited quantities of conservation education materials to Fort Riley.

5.6. County Governments and Other Municipalities

The Geary and Riley County Weed Departments inspect installation lands periodically for noxious weeds. The DES, Conservation Division is contacted by County Weed Supervisors to notify the installation of locations of noxious weeds for control. Also, they assist the installation in its own surveys to locate problem areas for noxious weed control.

5.7. Contractors

Dynamac Corporation provides various environmental support services, ranging for pollution prevention to conservation, to the DES. A fish and wildlife biologist and an agronomist provide various support, such as planting food plots, to DES, Conservation Division program managers.

Other contractors provide services and supplies for the DES, Conservation Division's natural resources management efforts. These contractors range from local farmers planting wildlife food plots to national corporations developing Environmental Baseline Studies/Findings of Suitability to Lease (EBS/FOSL) for the agricultural outlease program. When procuring services and supplies, DES, Conservation Division personnel attempt to find local suppliers whenever possible.

5.8. Other Interested Parties

Other interested parties include non-profit conservation organizations, Partners in Flight, and various customers.

5.8.1. Non-Profit Conservation Organizations

Fort Riley partners with several private, non-profit conservation organizations to leverage installation funds to manage wildlife. The Rocky Mountain Elk Foundation, Ducks Unlimited, Quail Unlimited, Pheasants Forever and the National Wild Turkey Federation have donated funding, supplies, and equipment to a value of $137,500.00 between 1992 and 2001. This does not include labor and logistical support donated to conduct specific activities such as elk stocking.

Most of this funding has been used to defray the expenses of habitat management projects, such as food plot planting. Some funding from the Elk Foundation has been used to defray the cost of renting commercial aircraft for elk surveys. All funding is used for "on-the-ground" expenses, however no funds have gone to administrative overhead.

Numerous presentations are made by DES, Conservation Division personnel to local groups such as Boy Scouts, the Northern Flint Hills Audubon Society, the KSU Student Chapter of the Wildlife Society, the Military Bass Anglers Association (MBAA) and the Riley and Geary County Fish and Game Associations. Every year, the Junction City Chapter of the Audubon Society conducts part of its Christmas bird count on the installation. Cooperative efforts have been important in the past and will continue to be important efforts.

5.8.2. Partners in Flight

The National Fish and Wildlife Foundation initiated "Partners In Flight (PIF)"in 1990. Its purpose is to galvanize Federal, State, and non-governmental organizations involved in the conservation and management of neotropical migratory birds (NTMBs). DoD joined the PIF initiative in 1991. Fort Riley is located in the PIF Midwest Region.

Integrating Fort Riley representatives in the various regional and state working groups ensures that installation actions are linked to the overall PIF strategy. In fact, a biologist of the DES, Conservation Division is the DoD's Midwest representative.

5.8.3. Customers

The customers served by the DES, Conservation Division are diverse and widely dispersed.

5.8.3.1. Soldiers and Families

The fort's Organizational Self-Assessment (Fort Riley, 2000) states that the fort's key customers are units, soldiers, and soldiers' families, and taking care of these customers is a primary mission of the DES, Conservation Division. The principles, programs, and projects defined by this INRMP are measured against this mission. Effective natural resources management ensures the long-term sustainability of the training land used to develop warfighting skills. Besides providing soldiers effective training lands, natural resources management activities are focused on improving the Quality of Life of the soldiers and their families by providing natural resources-based recreation such as hunting, angling, fuelwood cutting, and bird watching. Also, Quality of Life is improved by providing comfortable and pleasant living areas through control of nuisance and pest wildlife and plants.

5.8.3.2. Local Community Residents

The adjacent cities and surrounding small towns and rural areas are home to a population associated with Fort Riley. Many military personnel retire to the Fort Riley area specifically for the opportunity to utilize the natural resources available on and around the installation. Local civilians and retirees are permitted to utilize Fort Riley's natural resources through hunting, fishing, fuelwood cutting, hay harvesting, and many other consumptive and non-consumptive activities. These customers are also directly or indirectly affected by management activities that may have influences off the installation, such as prescribed burning, pond construction, and erosion control. Section 16, *Biopolitical Issues*, discusses interactions with the local community relative to natural resources management.

5.8.3.3. Non-residents

Another customer base of great importance, primarily associated with hunting, is the non-local visitor. Fort Riley's natural resources provide recreational opportunities for several hundred hunters from more than 30 states during the fall hunting seasons. These users, like the local users, are significant stakeholders in this plan.

6.0 NATURAL RESOURCES AND CLIMATE

This chapter describes Fort Riley's natural resources, specifically, the condition of each and existing or needed planning level surveys for each. This chapter does not, however,

address the planned management of the natural resources. That is discussed in Section 8.0.

6.1. Setting

Fort Riley is located in Geary, Riley, and Clay counties of northeastern Kansas. The Republican, Smoky Hill, and Kansas rivers form part of the fort's southern boundary. Milford Lake, a 15,000 acre impoundment of the Republican River, forms part of the fort's west boundary.

The general character of the area surrounding Fort Riley is rural with small farm communities. However, the fort does abut one larger community to the west (Junction City) and lies near another to the east (Manhattan). Lands north of Fort Riley support row crop and cereal grain production. Lands to the south are predominantly rangeland.

The ecoregional province in which Fort Riley lies is Prairie Parkland (temperate) (Bailey et al. 1995). Bailey's (1995) description of the province is located in Appendix C, Exhibit 1. Fort Riley's parkland system is maintained primarily by anthropogenic (man-made) influences and, secondarily, by natural factors. The grassland is interspersed by linear communities of woodlands, highly variable in width, that are associated with streams, other woodland plantings, relatively small, man-made water impoundments, and structures. The closer the tributary streams are to the river, the greater their influence on flora and fauna. The flora and fauna in some locations are further influenced by their proximity to Milford Lake.

6.2. Topography

Fort Riley lies within the Osage Plains section of the Central Lowlands physiographic province. It is bordered by the Great Plains on the west and the Ozark Plateau on the east. Elevations on Fort Riley vary from 1,025 to 1,365 feet (312 to 416 meters) above mean sea level. Terrain varies from alluvial bottomlands along the Republican and Kansas Rivers on the southern portion of the installation, through the hilly to steep lands in the central and east portions, to the high uplands in the north and west portions.

6.3. Geology

Fort Riley is comprised of three types of geological-physiographic area: 1) high upland prairies; 2) alluvial bottomland flood plains; and 3) broken and hilly transition zones. The high uplands, or prairies, consist of alternating layers of nearly level to gently dipping limestone and shale of the Permian.

The uplands often contain various shale units that cover the escarpment-forming limestones. The cutting action of the streams on the thick shale units has sculpted much of the area into a rolling plateau. Two types of alluvial bottomlands exist at Fort Riley: wide meandering floodplains of major rivers, with associated terraces; and areas created by smaller creeks and streams that cut the uplands. The transitional areas, extending from the uplands down to the valley floors are broken, sloping to steep country composed of alternating limestones and shales.

Fort Riley is located within a Zone II seismic area, including the entire Flint Hills area from Oklahoma through east central Kansas to Nebraska. A small fault located northeast of Fort Riley near Tuttle Creek Lake appears to be inactive. Nevertheless, earthquakes producing moderate structural damage are possible within the Fort Riley area. No other identified geologic hazards exist in the Fort Riley area.

6.4. Climate

The description of Fort Riley's climate is taken from the U.S. Department of Agriculture and is based on 100-year data. Although these data were published in 1975, they continue to be reflective of the Fort Riley region. Fort Riley has a temperate continental climate characterized by hot summers, cold, dry winters, moderate winds, low humidity, and a pronounced peak in rainfall late in the spring and in the first half of summer. Prevailing winds are from the south to southwest during most of the year, except during February and March when the prevailing winds are from the north.

Temperatures in the Fort Riley area vary widely and often fluctuate abruptly throughout the year. July and August are the hottest months, averaging 80° F. January is the coldest month averaging 26° F. The average date of the last killing frost in spring is 22 April, and the average date of the first killing frost of the fall is 17 October. The area has an average of 180 frost-free days per year (U.S. Department of Agriculture, 1975).

Average yearly precipitation is 31.64 inches and most of the precipitation (75%) falls within the six (6)-month period from April through September, with the three highest rainfall months (May, June, and July) each averaging more than 4 in. per month. Much of this precipitation occurs during severe thunderstorms, when 2 in. (5 cm) or more of rain may fall in one storm. December, January, and February are the driest months with each averaging less than 1.56 in. of liquid-equivalent precipitation each month. An average of about 22 in. of snowfall occurs annually (U.S. Department of Agriculture, 1975).

Insufficient precipitation is the major limiting factor to plant growth at Fort Riley. Normally, spring rains are adequate to recharge soil moisture before the summer months when evapotranspiration rates normally exceed precipitation rates, especially in the latter half of the summer. In years of below average rainfall, soil moisture in the upper soil levels is depleted, which stresses shallow rooted plants.

6.5. Petroleum and Minerals

Sand and gravel are available in abandoned river channels, on some of the flood plains, and in the present stream channels of the Kansas and Republican rivers. Chert gravel is available in some of the smaller streams that drain through the cherty limestone hills on the northeastern portion of the post. Limestone is abundantly available as a source of crushed rock, agricultural lime, building stone, and for other construction purposes.

6.6. Soils

Fort Riley is part of the Great Plains Winter Wheat and Range Soil Resource Region. This region is covered with a foot or less of windblown material or loess. The loess rests upon alternating layers of weathered limestone and shale. Most soils are friable, silty loam 6 to 12 inches thick, overlying nearly impervious clays. Fort Riley's soils developed residually from parent materials and from other parent materials carried by water or wind and deposited at the installation. The permeability of post soils varies from excessively drained sandy lowland soils to tight clays with very slow permeability. Bedrock depths under these soils vary from 0.5 feet to more than 10 feet.

The USDA Soil Conservation Service (1996) mapped 36 soil series on Fort Riley and taxonomically categorized them into six soil associations. A soil type map of Fort Riley is shown on the next page as Exhibit 6.1.

6.6.1. Soil Associations

The Eudora-Haynie-Sarpy and Reading-Kennebec-Ivan soil associations occupy small areas on Fort Riley. The Eudora-Haynie-Sarpy Soil Association is located on the southern boundary of the installation along the Republican and Kansas rivers. These bottomland soils are vegetated by a mixture of trees and grasslands. The Reading-Kennebec-Ivan Soil Association occurs near the northeastern boundary of the installation along Wildcat Creek and its tributaries. These soils are typically forested.

The most abundant soils on Fort Riley are the Wymore-Irwin, Clime-Sogn, Benfield-Florence, and Smolan-Geary associations. These soil associations represent more than 85% of the land area on Fort Riley.

The Wymore-Irwin soils are deep, nearly level to sloping silty clay loams on uplands. They are located along a corridor on either side of old Highway 77 that transverses the installation from south to north and thus receives the bulk of the vehicular traffic associated with the training mission at Fort Riley. The Wymore-Irwin soils tend to be droughty and are subject to water erosion if left unprotected.

The Clime-Sogn soils are moderately deep to shallow, sloping and moderately steep silty clay loams on uplands. The lack of soil depth and slope position of these soils makes them subject to severe erosion if unprotected. These soils occur prominently in the Impact Area and in Training Areas on the east, south, and west of Custer Hill.

The Benfield-Florence soils are moderately deep, sloping and moderately steep, silty clay loams and cherty silt loams on uplands. Slopes up to 20% make these soils subject to severe erosion if unprotected. These soils are most common on the eastern side of Fort Riley.

The Smolan-Geary soils are deep, gently sloping and sloping silt loams, on high terraces and uplands. These deep loess soils are subject to severe erosion if not protected. All of Maneuver Area C is included in the Smolan-Geary Soil Association.

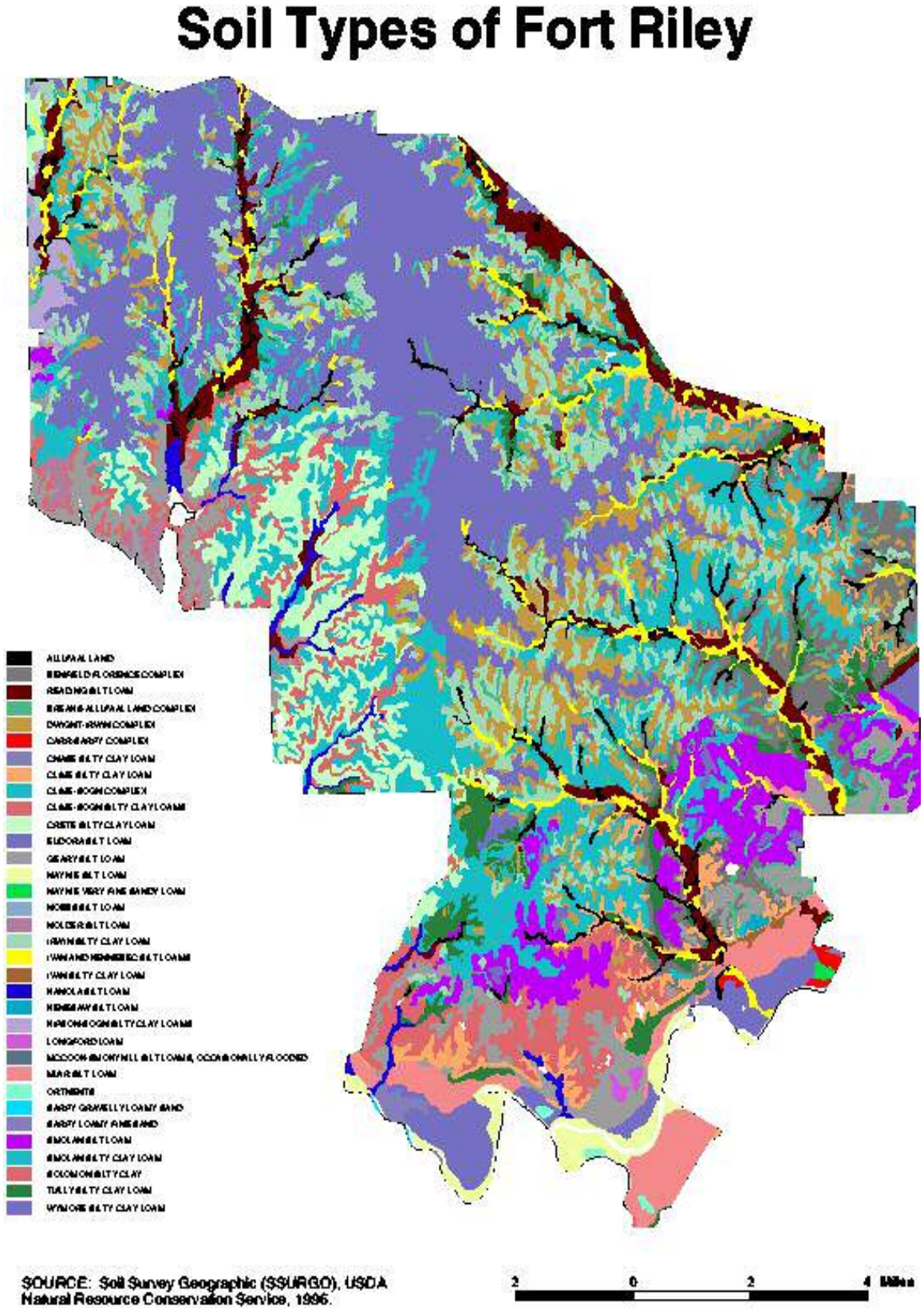
Soil Types of Fort Riley
ALLUVIAL LAND
SOURCE: Soil Survey Geographic (SSURGO), USDA Natural Resource Conservation Service, 1996.
2 0 2 4 Miles

Exhibit 6.1

6.7. Water Resources

Water Resources covers ground water and surface water, emphasizing streams, impoundments, and surface water quality.

6.7.1. Groundwater

Groundwater aquifers occur in the alluvial deposits of the major streams and rivers, in the porous surface deposits, and in the fissured, near-surface limestone of the upland areas (U.S. Army, undated). Saturated, water-bearing sediments in the Kansas River Valley range from 0 to 90 feet in thickness. Well yields of 300 to 1000 gallons per minute are obtained from aquifer thicknesses of 20 to 40 feet, and yields in excess of 1000 gallons per minute can be obtained where aquifer thicknesses exceed 40 feet (U.S. Army, undated).

Moderate quantities of groundwater occur in the bedrock formations of the area, in particular the Fort Riley and Florence limestone formations. Where these limestones are fractured and/or contain solutioned cavities, well yields of 100 gallons per minute or more can be obtained. Wells penetrating shales in the upland area will generally yield up to several gallons per minute (U.S. Army, undated).

Discharge from the valley-fill sediments, the major water-bearing deposits, is by seepage to major streams, evapotranspiration, and withdrawal by wells. Recharge of these deposits is by direct infiltration of precipitation, by seepage from streams and ponds, by return flow from irrigation, and by seepage from the bedrock formations that border and underlie the valley.

6.7.2. Surface Water

Surface waters at Fort Riley are located within the Kansas River Basin and consist of rivers, perennial and intermittent streams, ponds, and lakes. These surface waters and surrounding off-post waters on shown in Exhibit 6.2 on the next page.

6.7.2.1. Streams

Nearly 145 miles of rivers and streams, consisting of 13.6 miles of rivers and 131 miles of streams, are on Fort Riley, including fourteen streams, all intermittent except for Wildcat, Sevenmile, and Madison creeks. Streams in the southern portion of Fort Riley drain to the south to the Republican, Smoky Hill, or Kansas rivers, which form the installation's southern boundary. Streams in the western portion of Fort Riley drain toward the southwest to Milford Lake on the Republican River. Streams in the northeastern portion of Fort Riley drain to the northeast to Wildcat Creek, a tributary of the Kansas River.

Streams on Fort Riley have a nearly stable gradient and well-developed floodplains. Smaller streams and intermittent drainages have steeper gradients and narrower channels and floodplains. Maximum depth of streams ranges from 1 to 6 feet. Minimum depths are less than 1 foot. Maximum widths of the streams range from 14 to 35 feet. Minimum widths are from 1.6 to 22.3 feet. Water velocity varies from 0 to 3 cubic feet per second. Percent canopy closure of these streams is from about one-half to nearly complete.

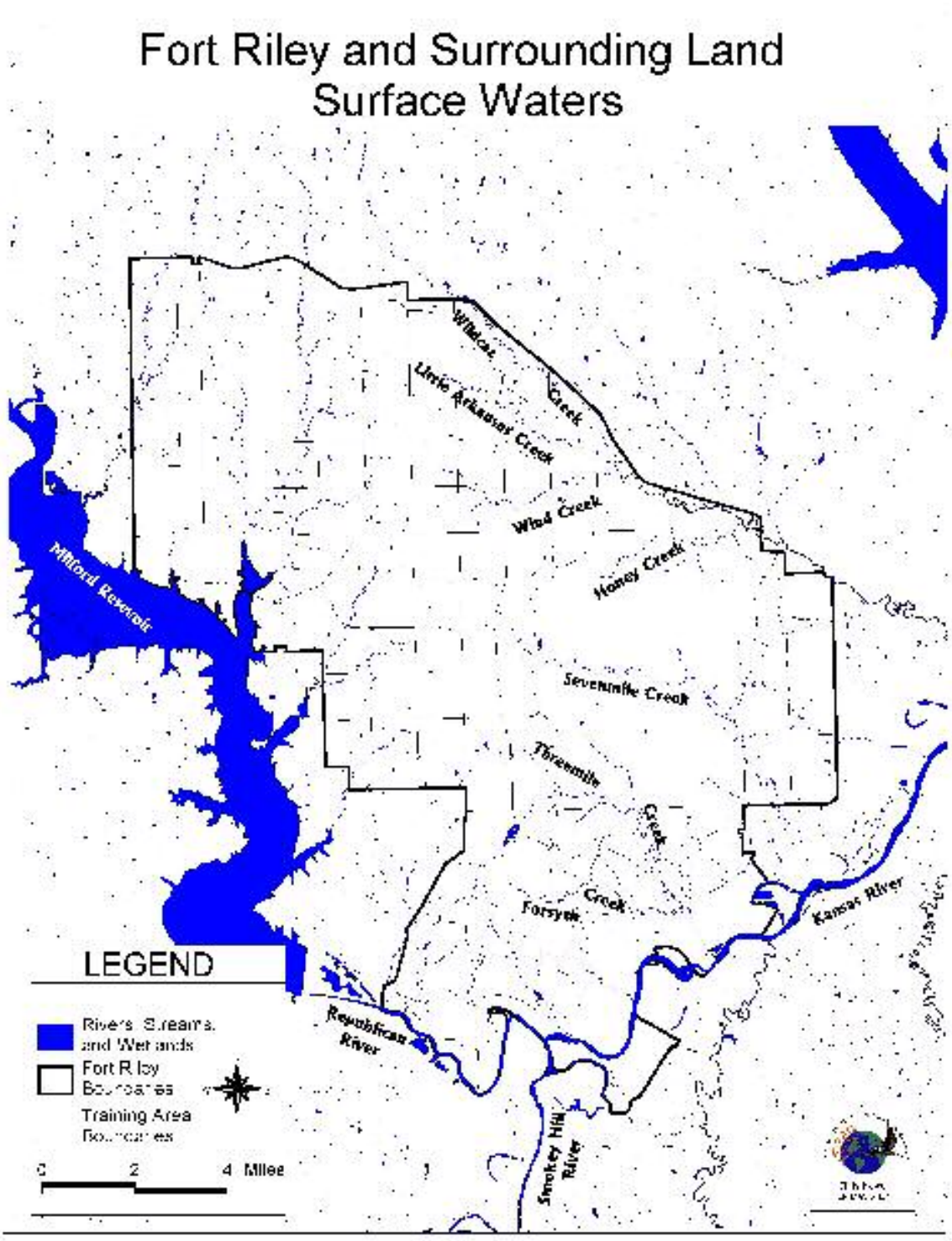
Fort Riley and Surrounding Land
Surface Waters
Wildcat Creek
Little Arkansas Creek
Wind Creek
Honey Creek
Milford Reservoir
Seventmile Creek
Threemile Creek
Forsyth Creek
Kansas River
Republican River
Smokey Hill River
LEGEND
Rivers, Streams, and Wetlands
Fort Riley Boundaries
Training Area Boundaries
0 2 4 Miles

Exhibit 6.2

6.7.2.2. Wetlands

Wetlands are defined as "those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." [(COE, 33 CFR Part 328.3 (b); EPA 40 CFR Part 230.41) or (COE, 33 CFR Part 328.3 (b); EPA 40 CFR Part 230.3)].

The U.S. Fish and Wildlife Service mapped wetlands on Fort Riley in 1991 as part of its National Wetlands Inventory (NWI). Exhibit 6.2 on the previous page includes the NWI map. Wetland areas were identified through stereoscopic analysis of high altitude aerial photographs taken during the summer of 1985. Then wetlands were classified in accordance with Cowardin et al. (1979) based on the photographs through interpretation of vegetation, visible hydrology and geography.

Wetland areas on Fort Riley include springs and seeps, streams, rivers, ponds and lakes, low areas behind terraces in abandoned crop-fields, and emergent marshes along the periphery of waterbodies, such as those within the Madison Creek and Farnum Creek arms of Milford Lake. Approximately 1536 acres of wetlands are present on post according to a National Wetlands Inventory completed in 1991 by the U.S. Fish and Wildlife Service. Of this total, 972 acres are considered permanently inundated. The majority of all wetlands are riverine; riverine habitat comprises 144.8 miles and encompasses 748 acres. Lacustrine and palustrine wetlands cover 431 and 270 acres of the post, respectively.

6.7.3. Surface Water Quality

This section provides baseline information pertaining to surface water quality on Fort Riley. This baseline information was collected during the 1980's and 1990's by state and federal agencies.

The State of Kansas has assigned surface water use categories for the Republican River, Smokey Hill River, Kansas River, and Wildcat Creek. Designated uses are in Kansas Water Quality Standards. The Kansas Department of Health and the Environment has determined these surface water bodies are suitable for, and should be protected for, non-contact recreation, expected aquatic life, consumptive recreation, domestic water supply, agricultural water supply for irrigation and livestock, industrial water supply, and groundwater recharge.

The Kansas Department of Wildlife and Parks and Kansas State University-Division of Biology and their Department of Biological and Agricultural Engineering have collected water quality data for streams on Fort Riley. KSU collected data during three research projects conducted during the late 1990's and into 2000.

The KDWP collected data as part of a series of statewide stream surveys conducted in 1996 on Timber Creek and on Fourmile Creek in 2000. The KDWP collected data on conductivity, turbidity (FTU), total dissolved solids (mg/L), salinity, dissolved oxygen (mg/L), pH, alkalinity, chlorides, ammonia, nitrates, and phosphorus. Most of these

parameters reflected high water quality at both creeks when compared to the statewide average of parameters collected at 325 sites.

Total dissolved solids (TDS) at Timber Creek (323 mg/L) and TDS at Fourmile Creek (298 mg/L) were less than the state-wide average (429 mg/L). Turbidity values were substantially better at Fourmile Creek (7.00 FTU), reflecting better clarity, than the state-wide average. Turbidity at Timber Creek (92 FTU) was more than the statewide average (62.70 FTU). Both creeks had lower levels of nitrates, phosphorus, and ammonia that the statewide average. These lower parameters probably reflect the lack of agricultural operations at Fort Riley. Dissolved oxygen was higher at Fourmile (8.4 mg/L) than the statewide average (6.04 mg/L) but was lower at Timber Creek (3.75 mg/L). Alkalinity was higher at Fourmile (304 mg/L) than the state-wide average (196 mg/L) but lower at Timber Creek (43.5 mg/L). Alkalinity values at Fourmile probably reflect the underlying bedrock of limestone, whereas the low alkalinity at Timber creek reflect the influence of Milford Lake.

Quist (1999) collected physiochemical data relative to fish habitat analysis on all fourteen Fort Riley streams. Data collection for this Masters level research project was conducted between 1997 – 1998. The parameters that were collected were turbidity, dissolved oxygen, conductivity and phosphorus. Turbidity values varied widely and ranged from 0.0 FTU (Honey Creek) to 89 FTU at Madison Creek. Dissolved oxygen levels ranged from 6.6 mg/L to 8.3 mg/, all of which are above the statewide average reported by KDWP in 2000 (6.04 mg/L). Phosphorus levels ranged from 0.23 (mg/L) to 5.50 mg/L. The highest level was at Forsyth Creek where effluent from a wastewater treatment is discharged. All streams had lower conductivity values than the state-wide average recorded in 2000.

Sample (1996) collected water quality data for the ITAM program comparing hardened stream crossings to unimproved earthen fords at six streams on Fort Riley. The project was undertaken as a Master's of Science research project for Kansas State University. Sample collected data on turbidity, total solids, total dissolved solids, total suspended solids, settable solids, pH, total hardness, calcium hardness, and total alkalinity. These parameters were tested at 8 earthen and 9 hardened stream crossings prior to and after traffic simulation. Sample concluded that water quality associated with hardened stream crossings was better than that associated with earthen fords.

The U.S. Geological Survey (USGS) conducted a study of water quality (1986 – 1990) as part of the National Water Quality Assessment (NAWQA) Program in the lower Kansas River basin, a 15,300 square mile area in southeastern Nebraska and northeastern Kansas. The findings were reported in 1996. One of the 91 monitoring stations in the watershed is located at Fort Riley. This station is on the Kansas River at the southeast edge of Fort Riley. Major water quality parameters monitored by USGS include flow, pH, alkalinity, dissolved solids, suspended solids, the dissolved ions of calcium, magnesium, sodium sulfate chloride, fluoride, nitrate, nitrite, ammonia, phosphate, dissolved oxygen, 15 different trace metals in suspended sediment, the coliform bacterium (*E. Coli),* and 64

different herbicides and insecticides. Discussion of selective parameters from the 1996 report follows.

Total dissolved solids (TDS) in waters of the Kansas River at Fort Riley represent the one water quality parameter that was elevated above normal values in the region during USGS monitoring from 1987 to 1990. The median concentration of TDS was 880 milligrams per liter (mg/L), which exceeded the Secondary Maximum Contaminant Level of 500 mg/L established by U.S. Environmental Protection Agency (USEPA) for dissolved solids in drinking water. During this same monitoring period, the median TDS concentration in the Kansas River at Topeka was 260 mg/L, indicating TDS dilution by other low saline tributaries. High TDS in the Kansas River at Fort Riley was attributable to the discharge of saline groundwater from Permian formations into the Smokey Hill River upstream of the juncture of the two rivers.

Concentrations of dissolved boron and lithium were generally higher in the Kansas River at Fort Riley than in other surface waters of the river basin. The concentrations did not exceed drinking water standards and were considered by the USGS to come from saline groundwater seeping into the Smokey Hill River upstream of the point where it discharges to the Kansas River at Fort Riley.

Atrazine herbicide was the most commonly detected agricultural chemical of the 64 different herbicides and insecticides analyzed in the 1987 to 1990 USGS monitoring. Most herbicides and insecticides were not above their analytical detection limit between 1987 and 1990 with the exception of Atrazine. When detectable quantities of pesticides and insecticides other than Atrazine were found, they were at concentrations less than USEPA drinking water standards. Atrazine concentrations were not provided for individual stations in the USGS report; however, trends for the Kansas River were addressed. In general, the highest concentrations of Atrazine in stream or river water were in areas where agricultural use of Atrazine was most prevalent. The USEPA drinking water Maximum Concentration Level (MCL) of 3 micrograms per liter (3 µg/L) for Atrazine was exceeded in about 10% of the 473 samples analyzed during the 1987 to 1990 monitoring in the Kansas River Basin study.

Water from the Kansas River at Fort Riley has high hardness, which characterizes all waters of the region. The USGS reported the Kansas River water at Fort Riley had low *E. coli* counts, indicating the waters were not adversely impacted by sewage pollution.

6.8. Flora

Under natural conditions, this region consisted of tall- and mixed-grass prairies dominated by big bluestem, indiangrass, and switchgrass (Kuchler, 1974). The pre-settlement prairie was maintained through periodic wildfires and grazing by herbivores. Woodlands were present within moist bottomlands of floodplains and along perennial stream corridors. However, past and current land management practices, such as the suppression of wildfires, the introduction of agriculture and stock grazing, and the construction and expansion of military facilities, have resulted in the establishment and expansion of several vegetation classes at Fort Riley.

Altogether 233 plant species from 178 genera and 59 families have been collected and preserved as part of the LCTA program at Fort Riley (Fort Riley, 1999). Furthermore, the number of plant species identified at Fort Riley is expected to increase as surveying and collection efforts continue. Appendix C, Table 1 lists the common names and scientific nomenclature of plant species (including herbaceous and woody species) collected by LCTA surveys.

Exhibit 6.3 on the next page shows the coverage of four broad categories of land cover type on the installation. These categories are grassland, woodlands and forests, water and urban areas.

6.8.1. Grasslands

Grasslands on Fort Riley consist of two basic types: native grasslands and "go-back" areas. Areas designated as "go-back" are lands that were once cultivated. Grasslands comprise about 67% of the installation and “go back” areas 33%. The extent of these grasslands is shown on the land cover map.

6.8.1.1. Native Grasslands

The native grasslands of Fort Riley consist primarily of tallgrass prairie. Some elements of the mixed-grass prairie exist because Fort Riley is located near the transition zone between the tallgrass prairie and the mixed-grass prairie to the west (Kuchler, 1974).

The native grasslands on Fort Riley generally do not exhibit climax dominance patterns of big bluestem, indiangrass, switchgrass, or the mid-grasses, such as little bluestem and sideoats grama. Past land use activities, minimal management, and military training exercises have produced native grasslands that exhibit a disclimax species composition and that have been invaded by woody species. The grasslands with the least disturbance contain the highest percentages of native warm-season grasses, such as those mentioned above, and associated forbs. Based on information collected in transects throughout the installation, low to moderate levels of disturbance may increase the amount of indiangrass in tallgrass communities. Other grasses, such as tall dropseed, tall witch grass, and foxtail, also increase as a result of disturbance. (U.S. Army Corps of Engineers, 1991).

6.8.1.2. “Go-Back" Grasslands

Some of the “go-back” areas on Fort Riley ceased to be cultivated prior to their acquisition by the Army. Most ceased to be cultivated after acquisition. The “go-back” lands are in various stages of ecological succession. Early seral stages consisting of annual grasses (prairie threeawn, green bristlegrass, Japanese brome) and forbs (Missouri goldenrod, daisy fleabane, snow-on-the-mountain, western ragweed) are present in areas that continue to have frequent vehicular traffic (e.g., parts of Maneuver Areas A, D, B and E).

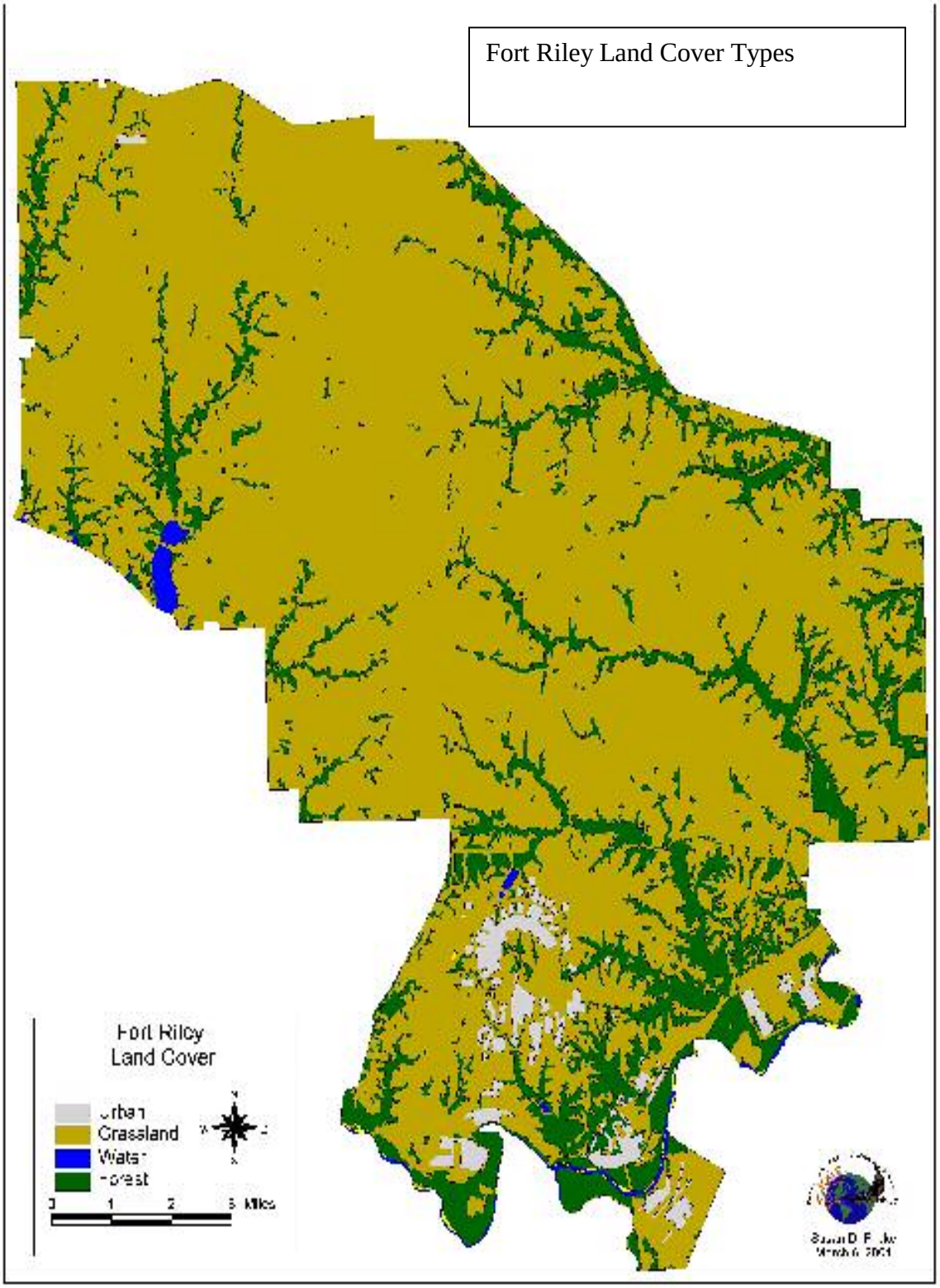
Fort Riley Land Cover Types
Fort Riley
Land Cover
Grassland
Miles

Exhibit 6.3

Other “go-back” grassland areas not as frequently or intensively impacted by military vehicles are in slightly further developed seral stages. Dominant species in these areas are those typically occurring in the post's native grasslands or cool season perennial "tame" grasses (mainly smooth brome and lesser amounts of tall fescue) or mosaics of native tallgrass prairie species and perennial cool season "tame" grasses. More than 75% of Maneuver Area O consist of “go-back” and disturbed, but not previously cultivated, grasslands. Also, maneuver Areas D, H, and K each have more than 2,500 acres of “go-back” land primarily in their eastern portions.

6.8.2. Shrublands

Extensive areas of shrubland are not a natural feature of the prairie environment. The reduction in wildfires and grazing practices employed prior to the fort's acquisition by the U.S. Government, as well as the abandonment of cropfields upon the area's acquisition and subsequent fire suppression efforts, have contributed to the establishment of shrublands on Fort Riley. Nevertheless, shrublands remain a minor component of the fort's landscape, covering no more than 2 to 5 percent of the post.

Shrublands are located along the edges of woodlands, and in isolated patches along the smaller intermittent drainages and ravines, and sheltered areas within grasslands. The vegetation represents a successional stage between grassland and young woodland. The most common species include plum, rough-leaved dogwood, smooth sumac, buckbush, eastern red cedar, Arkansas rose, grasses, forbs, and smaller individuals of hackberry, American elm, and other trees.

6.8.3. Forestlands

Forestlands comprise approximately 16,400 acres of Fort Riley. Most of this acreage is associated with the bottomland forests along the Republican and Kansas Rivers and the woodlands within the drainages of Threemile, Sevenmile and Wildcat Creeks. However, upland forests on the north and east faces of hills and canyons, and other woodland plantings have been established by man.

6.8.3.1. Forest Characteristics

Kansas State University mapped forest types on the installation and documented the woodlands vary in species composition, stand size classes, and stocking densities depending on their landscape position in 1986. A Forest Type Map was produced and continues to be a generally accurate portrayal of Fort Riley forest characteristics. The Forest Type Map is on file at DES, Conservation Division. Fort Riley’s forest conditions have been inventoried several times since 1987. The most recently was in 1998.

The bottomland forests along the Republican and Kansas rivers have a tall canopy formed by cottonwood, hackberry, green ash, red mulberry, sycamore, American elm, red elm, bur oak, chinkapin oak, and black walnut. The understory of these woodlands consists of woody shrubs or herbaceous cover.

Forests within higher elevations in smaller stream valleys and ravines are dominated by bur oak and chinkapin oak, American elm, red mulberry, bitternut hickory, black walnut, green ash, and honey locust on the lower slopes (U.S. Army Corps of Engineers, 1991) with the upper regions of some of these sites producing savanna type vegetation. The understory consists of grasses, forbs, shrubs, and young canopy species with varying densities and dominance patterns. Pole-size stands at higher elevations near the heads of drainages and in isolated patches are dominated by hackberry and American elm mixed with shrubs, forbs, and grasses. Upland forests are more extensive in the north and east aspects than in the south or west.

Twenty-eight tree species have been recorded on Fort Riley. The most common species are (in descending order) American elm (21.6%), hackberry (19.4%), and chinkapin oak (9.1%). The median forest tree is eleven inches Diameter at Breast Height (DBH) and is just less than 40 feet tall and about 40 years old. Most stands have a considerable number of pole size trees and are relatively young; only five of the 292 trees aged were more than 100 years old. Twenty percent of the trees are saleable, but they fall predominantly in the 16-20 inch DBH class. A significant portion (7.4%) of the standing trees in forest plots are snags, and nearly a quarter of the post's woodlands has excessive basal area (over 100 square feet per acre), which requires some form of thinning to maintain forest health.

Most areas contain mixed species, but some have primarily chinkapin oak or hackberry. The most common species of woody regeneration are American elm (24%) and hackberry (18%). Species composition is, however, generally shifting from an oak and hickory composition to nearly pure stands of hackberry, because although the regenerating hackberrys are less abundant than American elms, they are generally present in larger size classes than the elms. The primary factor for the species change is lack of disturbance in forest stands, allowing the shade tolerant hackberry to rise from understory to codominance.

The most common non-tree plants in the understory are rough-leaved dogwood (19%), Virginia creeper (12%), buckbrush (9%), and poison-ivy (8.4%), and the average height of understory plants is just over one meter. Approximately one percent of the understory vegetation in woodland plots is listed by Kansas as a noxious weed, the principal one being sericea lespedeza.

Most stands (83%) have minimal fuel-loading levels. The remaining stands have a moderate fuel loading level (fuels would burn from 1-10 hours).

6.8.4. Savannas

Fort Riley's ecosystem has natural components that are very like those in savannas, which are often considered ecotones between forests and grasslands. Savannas are defined in this plan and on Fort Riley as areas that have tree canopy coverage from 5-15%, are one acre or more in size, have associations with typical prairie vegetation and have canopies that are typical of open-grown trees. Savanna vegetation composition and density are mainly determined by fire. Consequently, the pattern and extent of present savannas depend on recent fire histories and the land's geomorphology. Most sites on Fort Riley meeting the

above criteria for a savanna are in Maneuver Areas A, D, J, and N. The total area of savanna sites on Fort Riley is approximately 450 acres.

A survey of Fort Riley's savannas was completed in 1999, and it showed more than one-fourth of the plots surveyed have significant visible fire indicators on the trees. Fort Riley's savannas have an average of 25 trees per acre. Thirteen tree species were recorded. The most common are hackberry (33%), American elm (22%) and green ash (12%). Sixty-two species of understory plants exist in Fort Riley's savannas; the most common are smooth bromegrass (37%), big bluestem (12%), Japanese bromegrass (5%), and little bluestem grass (5%). Notably, noxious weeds are very rare on the savanna sites (0.1%).

6.8.5. Croplands

Croplands are a minor component of the Fort Riley ecosystem but are important to wildlife. Approximately 1,600 acres are located along much of east, north, and west boundaries and are leased to local farmers. Approximately 500 additional acres of croplands serve as wildlife foodplots throughout the fort. Further discussion of croplands is found in Sections 8.3, *Agriculture Outlease* and 8.4, *Terrestrial Habitat Management*.

6.9. Fauna

Fort Riley habitat supports at least 43 species of mammals, 223 species of birds, 40 species of reptiles and amphibians, and 50 species of fish (U.S. Army, Fort Riley, Kansas, 1989c; Pitts et al., 1987; U.S. Army Corps of Engineers, 1991; U.S. Fish & Wildlife Service, February 1992; Busby et al 1994; Quist, 1999). Tables of various species and their scientific names are located are in Appendix C.

6.9.1. Game Animals and Furbearers

Fort Riley supports viable populations of all the typical game species found in this region of Kansas as well as the only huntable elk population in the state (1998 – 2001). Upland game birds include bobwhite quail, ring-necked pheasant (the only exotic terrestrial game species on Fort Riley), prairie-chicken, mourning dove, and woodcock. Also, a variety of ducks is common. Fox squirrels and cottontail rabbits are common; gray squirrels are uncommon; and jackrabbits are rarely seen. Those species that the state defines as "big game" on Fort Riley are white-tailed deer, mule deer (rarely), elk, and wild turkey. Furbearer species are badger, bobcat, mink, muskrat, opossum, raccoon, red fox, gray fox, striped skunk, coyote, and beaver. Principle game species and furbearers are described below.

6.9.1.1. Upland Game

Bobwhite Quail. Bobwhite quail occur throughout the post but are most plentiful in extensive edge habitat and mosaic vegetation communities. Their preferred habitat is a mixture of grassland, shrubland, woodland, and cropland (or ground dominated by annual plants) interspersed to provide abundant edge. Of those four vegetation types, the first three are present in adequate quantities along the installation's stream courses. Cropland

areas are, however, limited and restricted to those firebreak areas leased for crop production (less than 1,600 acres) and wildlife food plots (approximately 500 acres).

Quail populations fluctuate annually and are susceptible to adverse weather. However, habitat management such as winter food plots can reduce population fluctuations. Despite increased habitat management to improve quail habitat, spring auditory counts and other empirical evidence have suggested that populations have been, generally, decreasing on Fort Riley since 1993. The cause of that decline is not understood but is suspected to be a combination of population depressing factors such as poor nest success and recruitment due to weather and changes in predator assemblages and abundance.

Ring-necked pheasant. Fort Riley supports a modest population of pheasants. Annual spring auditory surveys indicate that pheasants are most abundant north of Vinton School Road. Their preferred habitat is roughly equal proportions of grassland, cropland, and shrubland with less woodland. Spring surveys suggest that the pheasant population has remained steady (changing less than 1% annually) until recently. However, 1998 counts declined 32% from 1997, and 1999 counts were 15% less than those of the previous year.

Fort Riley will probably never support high densities of pheasants, especially if biologically appropriate prairie management continues. Prescribed burning and other removal of invading brush reduce cover that pheasants prefer. Additionally, cropland areas are limited, and much of the grassland has either inadequate shrubland or has been invaded by isolated trees that provide little or no benefit. These trees also provide roosting sites for avian predators of pheasants and other game birds.

Greater prairie-chicken. Greater prairie-chickens sustain a viable population because Fort Riley has extensive grasslands. Spring lek surveys indicate that the greatest densities of prairie-chickens are in the central area on the largest expanse of high quality grassland. This grassland, relatively undissected by large creeks, is in the Danger Fan of the Multi-Purpose Range Complex (17, 0000 acres of contiguous native grassland). No leks have been found on the installation’s east side (Maneuver Areas C, F, and I) or south of Vinton School Road.

Spring lek surveys have been conducted since the mid-1980s, and results since 1994 suggest that prairie-chicken populations are increasing or at least holding stable. However, this apparent increase may be an artifact of intensive surveying by sufficient labor. Surveys prior to 1994 were less intensive due to labor constraints.

The highest number of leks in the last five years (26) and the most birds (256) were counted in 1998. Surveys from 1999 found 23 leks but a comparable number of birds. Counts in 2000 reflect still fewer leks (15) but again, a comparable number of birds.

Mourning dove. Mourning doves are well distributed because interspersed grassland, "go-back" shrubland, woodland, and weedy, disturbed sites provide excellent spring and summer habitat. Consequently, many doves nest on Fort Riley each year. Most migrate in

September, but a few individuals do winter at the installation. Doves are found where annual forbs are most abundant, often in disturbed areas.

Cottontail rabbits. Cottontail rabbits inhabit open forests (40–50 percent crown cover), forest edges, brushy areas and uncultivated fields, all of which are abundant and especially common around old building sites and on improved grounds.

Fox Squirrel and Gray Squirrel. Both fox and eastern gray squirrels are found on Fort Riley. Fox squirrels, which are occasionally seen as black-phase individuals, are common in the woodlands, especially in open oak-hickory gallery forests along Wildcat, Timber, and Madison creeks. They are also common throughout the cantonment and improved grounds. Conversely, gray squirrels are rare because Fort Riley lies on the extreme western edge of their geographical range.

American Woodcock. American woodcock are uncommon fall migrants on Fort Riley and rarely have been found nesting. Kansas is the western most limit of their range and as such are not a high priority management species. They are closely associated with woodland areas, particularly those along the rivers and streams.

6.9.1.2. Big Game

Of the wildlife found on Fort Riley, those the Kansas Department of Wildlife and Parks defines as "big game" are white-tailed and mule deer, elk, and wild turkey. Fort Riley supports established and huntable populations of whitetails, elk, and turkey. Few mule deer occur on-post because Fort Riley lies along the extreme eastern edge of their distribution range. The most recent recorded harvest of mule deer at Fort Riley was in 1984 when three were taken. However, since the early 1970's mule deer have been harvested very infrequently.

White-tailed Deer. The white-tailed deer in Kansas is a highly adaptable species whose numbers are growing. This species can adapt to many habitats but is most common in forest edges, woodlands, and riparian corridors. On Fort Riley, this species also inhabits mixed shrub and prairie communities as well as prairie/woodland edges.

Fort Riley's deer herd is characterized as productive since most animals have good body condition; males exhibit excellent antler development. Reproductive tract analysis and the fawn-doe ratio of harvested animals indicate that many female fawns of 6-months by early December are bred, and most yearling and adult does give birth to two fawns. Field dressed weights of female and male yearlings average 100 and 115 pounds, respectively. While 200+ pound (field-dressed) adult males are not common, neither are they unheard of.

Elk. Elk (also known as wapiti) are primarily grazing animals that inhabit open prairies and woodlands and woodland edges. They were extirpated from Kansas early during state settlement and were reintroduced to the Fort Riley region in 1986. Details of the reintroduction effort are in Section 8.9.

Intermittent aerial surveys of elk were conducted from 1986 until 1997, when systematic, rigorous aerial population surveys began. Surveys indicate that the herd had been increasing at approximately 20% annually. Surveys conducted in February 1998 suggested that the elk population was approximately 152-164 head. However, surveys in August 1998 (after spring calving), estimated the population to be 200-225. Surveys in 1999, 2000 and 2001 indicate that hunting mortality had reduced the herd size substantially.

The antlered to antlerless ratio is estimated to be between 3:1 and 4:1. The 1999 - 2001 surveys determined fewer animals consistently residing on-post but indicated comparable age and sex ratios. The high bull to cow ratio reflects that the bull harvest is conservative while the cow to calf ratio is approximately 1.6:1.0, which suggests high herd productivity.

Wild turkey. Turkeys are another species extirpated during Kansas's early settlement. They were reintroduced to Fort Riley in 1983 and are now commonly found throughout the post. Turkeys prefer oak-hickory gallery forests, but they also like secondary growth woodlands and mixed shrub/woodland habitats. Most turkeys on-post are of the eastern subspecies, but the Rio Grande subspecies and hybrids of the two subspecies are represented to a small degree.

6.9.1.3. Waterfowl

Fort Riley's numerous water impoundments provide feeding and loafing areas for waterfowl using the Central Flyway Migration Corridor during their spring and fall migrations. Eighteen species of ducks and three species of geese have been observed on Fort Riley. Common visitors include mallard, gadwall, green-winged teal, blue-winged teal, northern shoveler, American widgeon, pintail, scaup, and others. Canada geese are also common migrants and residents. Wood ducks, mallards, and blue-winged teal also have been verified to nest. Waterfowl species are listed in Appendix C, Table 2 (*Comprehensive List of Fort Riley Avian Species*).

6.9.1.4. Furbearers

Fort Riley's mixture of diverse vegetative communities, impoundments, and streams provides good habitat for several commercially valuable furbearers. Beaver, bobcat, muskrat, raccoon, coyote, red fox, striped skunk and badger are relatively abundant on-post. Gray fox are less common whereas few mink have been recorded. Long-tailed weasels have been recorded only twice.

The Kansas State University Cooperative Fish and Wildlife Research Unit conducted research 1996-2000 regarding niche partitioning among mammalian predators on Fort Riley. Data from that study show that Fort Riley has one of the highest densities of bobcats, coyotes, raccoons, and opossums reported in the literature.

Wildcat, Madison, Farnum, Threemile, Rush, and Timber creeks were surveyed for furbearer activity during the summer of 1986 (Robel et al,. 1987). Signs of beaver, muskrats, and raccoons were abundant along Madison Creek and the northern portions of Wildcat Creek. Relatively few signs were seen along Rush and Timber creeks. The other streams surveyed had moderate signs along their banks. No detailed population

data is available for other furbearers; however, coyotes and striped skunks were considered abundant.

6.9.2. Non-Game Animals

Non-game animals include mammals, birds, reptiles and amphibians, fish, and aquatic invertebrates.

6.9.2.1. Mammals

Twenty-four species of non-game mammals on Fort Riley were recorded by Pitts et al. (1987), during LCTA surveys (1990 –1998) and during routine field work (Appendix C, Table 3). Twelve of these non-game species are considered abundant on Fort Riley: Elliot's short-tailed shrew, eastern mole, big brown bat, thirteen-lined ground squirrel, plains pocket gopher, western harvest mouse, deer mouse, white-footed mouse, cotton rat, eastern woodrat, prairie vole, and house mouse. One of the rare species captured during LCTA surveys (1993) was the southern bog lemming, (a Kansas-listed Species in Need of Conservation). Armadillos and porcupines are considered uncommon species.

The Corps of Engineers-Waterway Experiment Station conducted a limited bat survey in 1997 as part of their Conservation Assistance Program. Two species of bats were captured using mist-nets: the little brown bat and the big brown bat. Most of the survey effort was oriented around historic buildings on Main Post, but some effort was in other improved grounds areas near waterways. Conservation Division staff conducted follow-up surveys in 1998 and 1999, which were expanded to included unimproved grounds as well as historic buildings. The only species captured was the big brown bat. Earlier, the Pitts (1987) recorded the eastern pipistrelle, red bats, and hoary bats as well as the little and big brown bats.

6.9.2.2. Birds

Numerous inventories of birds have been conducted on Fort Riley, resulting in the observation of 223 species, many of which are neotropical migrants. Table 2 (Appendix C) is a comprehensive list of bird species that have been observed on Fort Riley. Breeding bird surveys have been conducted by DES, Conservation Division personnel since 1989 and by DPTM, Range Branch personnel since 1990. Initially, the breeding bird surveys employed breeding criteria developed by the Breeding Bird Atlas Project's Breeding Bird Survey Route program. Since 2000, DPTM Range Branch personnel have adopted a count methodology recommended, which employs a modified point count-line transect to sample 60 plots.

Breeding bird surveys have documented 123 bird species on Fort Riley during "safe dates" (Table 4, Appendix C), periods when migrants of that species are expected to be absent from Kansas. If an adult of the bird species is observed within its breeding habitat between the "safe dates" probably that species breeds in the area. Of the 123 species, 58 have been confirmed to breed on Fort Riley, 26 are probable breeders, and 39 are possible breeders.

Some species of passerine (perching) birds confirmed to breed on Fort Riley include dickcissel, Henslow's sparrow, eastern phoebe, scissor-tailed flycatcher, barn swallow, white-breasted nuthatch, American robin, loggerhead shrike, chipping sparrow, common grackle, northern oriole, American goldfinch, and house sparrow. An additional 13 passerine species are considered probable breeders.

Nonpasserine land birds that have been confirmed to breed on Fort Riley include killdeer, upland sandpipers and common nighthawks. Of the waders, the great blue heron is the only one known to breed on Fort Riley; however, the green heron is a possible breeder.

Several raptor species have been observed within their breeding habitat between their respective "safe dates" and are thus considered possible breeders. These are red-tailed hawk, the northern harrier, the American kestrel, and great-horned and screech owls.

LCTA breeding bird surveys (1990-1995) documented bird abundance as well as simple presence (U.S. Army Corps of Engineers, 1991). The three most common breeding species were dickcissel on grassland and brush plots and eastern meadowlark and brown-headed cowbird on grassland plots. Other common passerine birds identified in the survey include blue jay, black-capped chickadee, red-winged blackbird, northern cardinal, eastern wood-pewee, mourning dove, and eastern kingbird. Abundance data for breeding birds are listed in Table 5, Appendix C.

An Army *Legacy* Project, Monitoring Avian Productivity and Survival (MAPS), has been conducted on Fort Riley each year since 1993. The purpose of the MAPS project is to provide annual indices and estimates of adult population size, post-fledging productivity, adult survivorship and recruitment for certain terrestrial bird species. The number of species captured has ranged from 40 to 49. The ten most abundant breeding bird species were, in decreasing order, the gray catbird, dickcissel, grasshopper sparrow, common yellowthroat, Bells' vireo, yellow warbler, brown-headed cowbird, northern cardinal, black-capped chickadee and American goldfinch. Three species captured are considered to be interior woodland species: the ovenbird, the wood thrush, and the prothonotary warbler.

DES, Conservation Division staff has conducted wintertime raptor surveys since 1983. The most common raptor observed is the red-tailed hawk, followed in descending order of frequency by northern harrier, bald eagle, rough-legged hawk, and American kestrel. Other raptors occasionally observed during the surveys are sharp-shinned hawk, Cooper's hawk, prairie falcon, and merlin Bald eagles are commonly observed during the winter along the Republican River, the Kansas River and Madison and Farnum Creek arms of Milford Lake. Peregrine falcons have been seen as rare transients and DES, Conservation Division staff observed a golden eagle in 1997.

The numerous ponds and lakes on Fort Riley provide loafing and migrating habitat for a variety of wetland dependent birds. Wading birds and waterfowl known to use Fort Riley wetlands during spring and fall migrations include great egret, sora, Virginia rail, common snipe, greater yellowlegs, lesser yellowlegs, least sandpiper, and Baird's sandpiper.

Systematic surveys of shorebirds found along the rivers adjacent to Fort Riley have been conducted annually since 1994, during which thirty-eight species have been observed. Two of these species set county records (sanderling, ruddy turnstone).

6.9.2.3. Reptiles and Amphibians

The Kansas Biological Survey (KBS) systematically documented herpetofauna in 1994. Thirty-nine species of reptiles and amphibians (17 species of snakes, 6 lizards, 7 turtles, and 9 amphibians) were captured or observed during the study.

The most common species observed are ringneck snake and western chorus frog. No Federal- or State-listed threatened or endangered species were observed. However, three rare species were captured: Texas horned lizard, western hognose snake, and False (Ouachita) map turtle. The only venomous species found was the copperhead snake. This species was described as "surprisingly common" on Fort Riley and seemed to live primarily along the forested hillsides of the southern and eastern portions of the installation. Finally, six of seven turtle species found are aquatic.

Two other species of reptiles and amphibians have been found on Fort Riley. These are brown snake (1993) and American toad (1994). Both of these are considered uncommon and had not previously been documented on Fort Riley or in the KBS survey.

6.9.3. Fish

Fish habitat on Fort Riley comprises perennial and intermittent streams and man-made and natural impoundments. Aside from the three rivers forming the installation's southern boundary, the perennial streams on Fort Riley are Wildcat Creek, Seven Mile Creek, Timber Creek, and portions of Threemile and Madison creeks. In particular, Wildcat Creek has been judged a significant fisheries resource (Kansas Fish and Game Commission, 1981; Kansas Department of Health and Environment, 1 May 1987). Kansas Department of Wildlife and Parks also have rated the Republican, Smoky Hill, and Kansas rivers as high priority fishery resources.

Numerous inventories conducted by personnel of the DES, Conservation Division, Kansas State University-Cooperative Fish and Wildlife Research Unit, Kansas Department of Wildlife and Parks, and U.S. Fish and Wildlife Service have documented 60 species of fish in Fort Riley's streams, lakes, and ponds. Table 6, Appendix C consolidates all fish species found, their common and scientific names, and their habitat.

Fisheries surveys of Fort Riley streams have produced a general portrait of fish assemblages. Fish species in streams in the western portion of the installation are largely represented by centrarchids (sunfish family), which prey largely on minnows (cyprinidae) as a large part of their diet. Largemouth bass, green sunfish, and bluegill are the major representatives. Also species of cyprinids occur including central stonerollers, fathead minnows, and red shiners in the western streams, whereas streams on the eastern side of the installation are dominated by cyprinids. Major representatives in these streams include redfin shiners, bluntnose minnows, fathead minnows, and central stonerollers (Quist, 1999).

Personnel of the DES, Conservation Division, the USFWS (July 1991 and January 1992) and the KSU Cooperative Fish and Wildlife Research Unit (1997) have conducted surveys of the Kansas, Smoky Hill, and Republican rivers for the sturgeon chub and other resident fishes. Altogether, 36 species have been found in these three rivers but the sturgeon chub was not been found and is considered extirpated (U.S. Fish and Wildlife Service, 1992). Fish species typically associated with the pool, run, or riffle habitats of these rivers include shovelnose sturgeon, suckermouth minnow, red shiner, sand shiner, bullhead minnow, bluntnose minnow, central stoneroller, river carpsucker, catfish, stonecat, western mosquitofish, Johnny darter, and orangethroat darter. Table 7, Appendix C, lists the fish species recorded during various stream and river surveys.

Fish assemblages in ponds and lakes are largely represented by species managed for recreational fishing. Channel catfish, largemouth bass, white crappie, and bluegill are the most abundant sport fish, whereas carp and smallmouth buffalo are the most abundant roughfish in lakes and ponds on-post. However, harvest-size rainbow trout are stocked into one pond, Cameron Springs, each year, if funding allows. Table 8, Appendix C lists the species found in each of the 29 managed lakes and ponds.

6.9.4. Aquatic Invertebrates

Surveys of Timber Creek in 1996 and Fourmile Creek in 2000 by the Kansas Department of Wildlife and Parks include inventories of aquatic insects and mussels. Altogether, 19 orders/families of aquatic insects and five species of mussels were observed in Madison Creek. Fourteen orders/families of aquatic insects and no mussels were found in Fourmile Creek. Mussels were counted as present whether observed alive or from relic shells.

During 1998–1999, DES, Conservation Division staff conducted a systematic survey of the fort's streams for mussels and found evidence of 17 species that have resided on Ft. Riley, of which seven species were found extant (Table 9, Appendix C). The other 10 species have apparently been extirpated from the installation. Two of the ten (black sandshell and hickorynut) have apparently been extirpated from the entire state. The most common species collected alive were the pondhorn, fragile papershell, pink papershell, and mapleleaf.

6.10. Threatened and Endangered or Rare Species

Numerous systematic surveys have been conducted since 1990 to determine the presence and distribution of threatened and endangered species or rare species of flora and fauna on Fort Riley. Prior to that time, irregular surveys only were conducted for the bald eagle.

Inventories have documented the presence of four Federally-listed and eight State-listed species, and 23 rare species. Nine other listed or rare species have never been observed but could possibly occur on Fort Riley. Rare species are those designated by the USFWS or the KDWP as "Species in Need of Conservation" (SINC). These designations confer no legal protection under the Endangered Species Act or the Kansas Nongame and Endangered Species Conservation Act.

6.10.1. Plant Species

The only plant species Federally-listed as threatened or endangered thought possibly to exist on Fort Riley is the western prairie fringed orchid. However, it has not been found despite systematic surveys. However, the hairy false mallow, formerly a Candidate 3 species, has been found on Fort Riley.

6.10.2. Animal Species

Four animals found on Fort Riley are Federally-listed and State-listed species. Three are birds: the bald eagle, least tern, and piping plover, none of which are year-around residents. The bald eagle winters on Fort Riley, and the other two species are uncommon migratory transients. All species generally use the major rivers and reservoir areas around the periphery of the post.

The Topeka shiner, a small fish, is the fourth species and the only Federally-listed species on Fort Riley year-round (Quist, 1999). This fish species was Federally-listed as endangered in 1999 and state-listed in 2000. It has been found in Wildcat, Sevenmile, Wind, and Little Arkansas creeks, all of which are streams on the east side of the fort. It has not been found in other Fort Riley streams despite systematic surveys.

Twenty-three animal species considered rare in Kansas are present on Fort Riley. Most of these are birds, five are reptiles or amphibians, three are riverine fish, two are insects, and one is a mammal. Descriptions, habitats and scientific names of the rare (also known as "sensitive") species present or potentially present on Fort Riley are provided in Appendix C, Table 10. More details pertaining to the management of the four Federally-listed and a recently delisted species (peregrine falcon) present on Fort Riley are contained in the fort's Endangered Species Management Plans (Appendix E).

6.10.3. Listed Habitats

There is no federal threatened and endangered species critical habitat on Fort Riley. However, the state has designated critical habitat on post for four species: bald eagle, piping plover, least tern and Topeka shiner. Prior to 2000, only state-designated critical habitat for the bald eagle was present on Fort Riley. The other three species were added in 2000.

State-designated habitat for the bald eagle was substantially expanded in 2000. Previously state-designated critical habitat was present along a 300 yards corridor from the normal highwater mark of the Kansas, Republican and Smokey Hill rivers. Currently, all lands and waters within five air miles of public lands around Milford and Tuttle Creek reservoirs have been listed by the state. Habitat designations along the rivers was changed to include all water and lands within a 100 yard corridor along the main stem of the Kansas, Republican and Smokey Hill rivers from the rivers' normal high water. All waters within the corridor along the main stem of the Kansas River have been listed as state-designated critical habitat for the least tern and piping plover. Wildcat, Little Arkansas, and Sevenmile creeks have been listed as designated critical habitat for the Topeka shiner.

7.0 LAND USE AND MANAGEMENT UNITS

The following section analyses land uses and management units by component.

7.1. Land Uses

Fort Riley consists of 100,656 acres (U.S. Army, Fort Riley, Kansas, 2000). On-post land use at Fort Riley has been identified using the categories established in US Army Corps of Engineers, Master Planning Instructions. The land use categories used by the Army are functional in nature, have a common purpose, and denote major land uses not minor adjuncts to the primary use. For example, an industrial land use area may also contain administration, medical, community facilities, and supply and storage areas.

The Training/Range land use category is the dominant one on Fort Riley. Cantonment areas that provide housing, community/recreation, and industrial and transportation operations are in the southern portion of the installation in seven distinct areas.

7.1.1. Cantonment Areas

Airfield, Maintenance, Industrial, Supply/Storage, Administration, Unaccompanied Personnel Housing, Family Housing, Community Facilities, Medical, Outdoor Recreation, and Open Space land use areas are generally concentrated in one of six cantonment (or developed) areas. These areas total approximately 11, 321 acres and are Main Post, Camp Forsyth, Camp Funston, Camp Whitside, Custer Hill, and Marshall Army Airfield.

7.1.1.1. Improved Grounds

Cantonment areas contain both improved and semi-improved grounds. The Main Post and Forsyth and Funston areas contain the oldest developments on Fort Riley; therefore, they have mature to over-mature plantings. Furthermore, these areas have large trees that require extensive maintenance because of their size, age, and species characteristics.

The Custer Hill Golf Course, parade and drill fields, cemeteries, and parks are interspersed throughout the cantonment areas south of Vinton School Road. Semi-improved areas include the ammunition storage area and small arms ranges, most of which are located north of Vinton School Road and along some roads (U.S. Army, Fort Riley, Kansas, 1988c).

Improved grounds include improved and semi-improved areas. Improved grounds contain many native and non-native trees, shrubs, and groundcovers on approximately 5,613 acres. Improved areas are mostly between and among existing buildings. Thus, these areas are maintained as mowed turf and planted with ornamental and native trees and shrubs. Indeed, improved areas form a significant part of the cantonment areas. In contrast, semi-improved areas are grassy fields and larger groves of trees that receive periodic mowing and maintenance.

The most intensely planted portion of Fort Riley is on Main Post near the Republican and Kansas rivers' floodplains and terraces. Here, the landscaping is more than a century old and represents some of the oldest plantings on Fort Riley. The improved grounds at Custer Hill were established in the mid-1950s and also contain some mature plantings; however, the more inhospitable conditions associated with this upland location have resulted in a higher mortality rate of trees and other plantings. In addition, much of Custer Hill was only minimally landscaped after construction. Consequently, this area has the greatest need for plantings to lessen the harsh environment due to climate and aesthetics.

Trees have been planted downrange in common areas of small arms firing ranges to create more realistic battlefield conditions. As a consequence of being downrange, the trees are often clipped by fired ammunition during target practice. Consequently, while some trees still remain, many of them have died. Because of the low success rate of these plantings, Fort Riley has discontinued the practice of downrange plantings.

7.1.1.2. Outdoor Recreational Facilities

Custer Hill Golf Course, constructed in 1957, is an eighteen-hole, par 72 course 7,072 yards. The 96,000 square feet of greens are in bentgrass, with 84,000 square feet of tees and 442 acres in a bluegrass and ryegrass blend. Approximately 125 acres are in the rough. Total area of the golf course is about 170 acres (U.S. Army, Fort Riley, Kansas, 1988c). The Directorate of Public Works maintains approximately 60 acres in three parks/picnic areas at McCormick, Moon Lake, and Wyman parks. Approximately 84 acres of ball fields and athletic fields are also located throughout the cantonment area. Informal outdoor recreational activities such as bird watching, hunting, hiking, fishing, mushroom hunting, walnut gathering, and mountain biking are permitted except where otherwise restricted.

7.1.1.3. Fort Riley Post Cemetery

The Fort Riley Post Cemetery, located on a hill just above the Republican River valley, was first used as a burial place for soldiers during the Indian conflicts in the 1850s. Since then, the cemetery has been expanded several times and currently covers almost eight acres.
The level of maintenance at the Post Cemetery is high. The ground cover at the cemetery is K-31 fescue grass with just over one hundred large shade trees spaced throughout the area. The turf is mowed, fertilized, irrigated, and treated with pesticides, as required, to maintain a well-groomed appearance.

7.1.1.4. Ammunition Storage Area

Fort Riley has fifteen earth-covered ammunition storage magazines, all protected from erosion by grass cover. The grassed area located inside the fenced ammunition storage point is 96 acres and has a soil depth of at least two feet.

7.1.1.5. Training Areas and Impact Area

Major training and range areas at Fort Riley are the following:

- One hundred designated training areas, 76 of which are combined into 17 larger maneuver areas, comprise approximately 70, 926 acres;

- The main impact area and the surrounding training live-fire ranges in the eastern portion, which cover approximately 16,200 acres;

- The Douthit Range Complex in the northwestern portion, which includes approximately 6,900 acres; and

The main Impact Area and the surrounding train fire ranges are off-limits to maneuver training, public use, and most management activities. Training and maneuvers that usually occur within the Douthit Range Complex Safety Fan cease when the Range is active. The Douthit Range Complex live-fire danger fan covers approximately 30,500 acres.

7.2. Management Units

DES, Conservation Division natural resources managers use military training units as the basis for managing various resources. These units meet the needs of outdoor recreationists as well as management practices. Management units must be multi-purpose not only to support various natural resources management but also human uses such as recreation and military training. In particular, military training takes precedence. One of the most critical functions is to make boundaries easily identifiable. In practice, this is as important as any scientific criteria. Consequently, natural resources management units based on ecological units such as watersheds are not, generally, established on Fort Riley. Three primary alternative management units are outdoor recreation areas, firearms deer hunting units, and forest stands.

7.2.1. Outdoor Recreation Areas

Outdoor Recreation and Fuelwood Cutting Areas are established to provide access for various recreationists and fuelwood cutters and to prevent interference with the military mission. They correspond, generally, with Military Training Areas and Maneuver Areas. However, further delineation has been established for certain high-interest areas. For example, an area along the Kansas River that is not part of an established Training Area has been designated as Outdoor Recreation Area 26 to better allow people to observe bald eagles. This map is shown as Exhibit 7.1 on the next page

7.2.2. Firearms Deer Hunting Units

Six large units help manage hunter access and maintain safety. These units are either in Kansas Deer Management Unit 8 or Unit 9. These units are not for managing the deer population or deer harvest. Instead, a limited number of firearms deer hunters is allowed in each unit during any given day of the firearms deer season. Also, the units have specific firearms restrictions. For example, rifles (using centerfire cartridges) are prohibited in the Unit that encompasses the area south of Vinton School Road; this area is only for muzzleloaders and shotguns. Units are divided along easily identifiable boundaries such as hardtop roads.

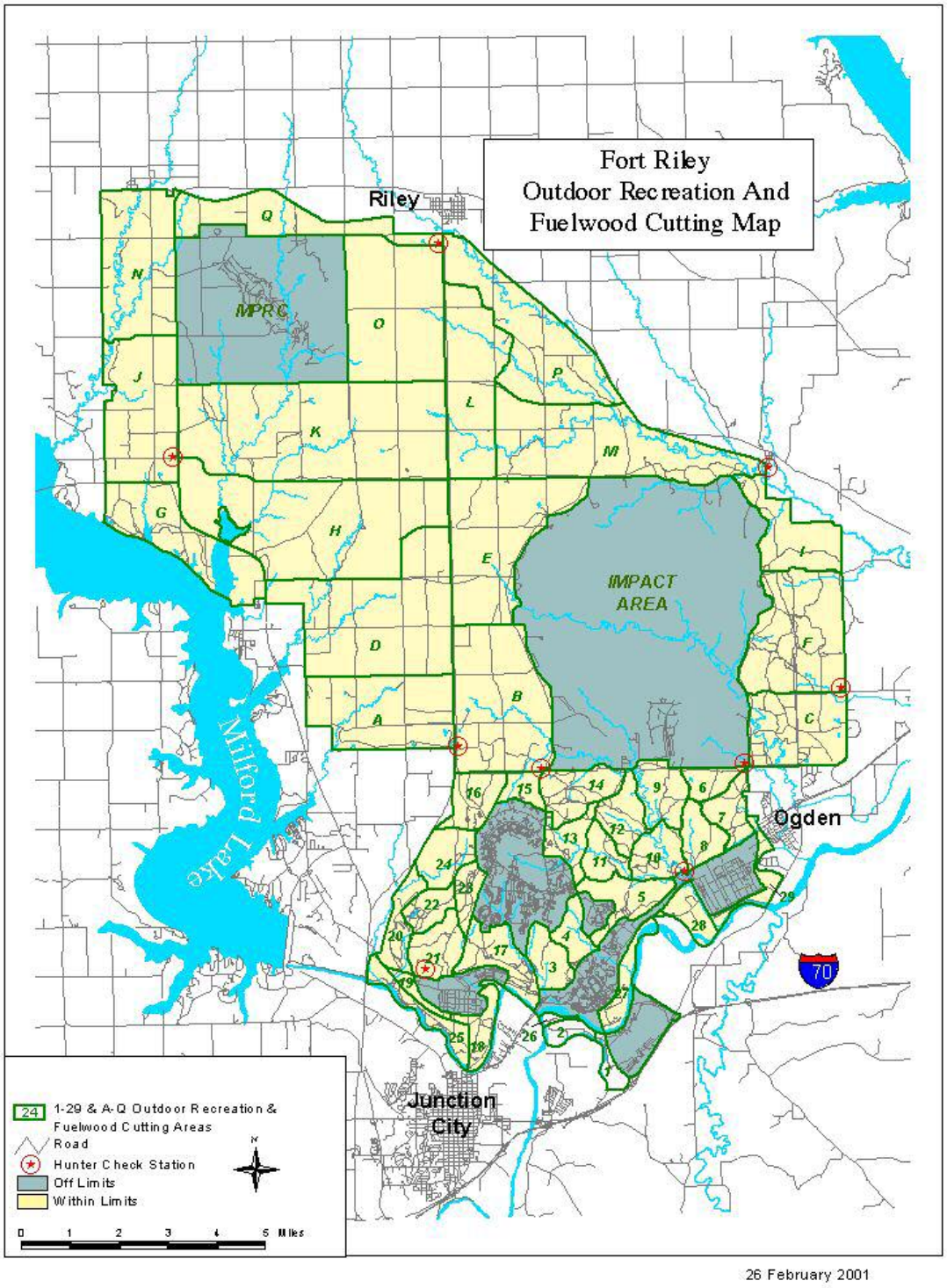
Fort Riley
Outdoor Recreation And
Fuelwood Cutting Map
Riley
MPRC
IMPACT
AREA
Milford Lake
Ogden
Junction
City
70
24 1-29 & A-Q Outdoor Recreation & Fuelwood Cutting Areas
Road
Hunter Check Station
Off Limits
Within Limits
0 1 2 3 4 5 Miles
26 February 2001

Exhibit 7.1

7.2.3. Forest Stands

Forested areas are divided into stands to reflect the character of contiguous forest. Therefore, stand delineations are based on boundary identification relative to general stand characteristics as shown on the 1986 Forest Type Map and the data from forest inventories.

8.0 NATURAL RESOURCES MANAGEMENT

This chapter describes what to consider when Fort Riley makes decisions about managing its natural resources. Objectives to attain and maintain Fort Riley's vision of its ecosystem health are listed. Also, current and future management practices that will be undertaken through 2005 are described in this chapter. These practices directly affect soil, water, vegetation, and fauna. As such, practices include forest and range management, agricultural production, training land reclamation, and direct manipulation of wildlife populations.

Other programs include wetland management, water quality programs, game harvest, pest management, wildlife damage control, urban natural resources management, endangered species management, and erosion control.

8.1. Objectives

Fort Riley's natural resources management program integrates a hierarchy of objectives. The highest level is Army Program objectives whereas the second level includes installation-specific objectives. Third level objectives are those for major resource areas such as forestry, fish, and wildlife. All objectives are scientifically-based and promote ecosystem integrity.

8.1.1. The Army's Program

The two primary Army objectives for natural resources management are stated in the *Commander's Guide to Environmental Management* (U.S. Army Corps of Engineers, 1994):

- Develop and implement progressive programs for land management and utilization; and
- Maintain and improve environmental quality, aesthetic values and ecological relationships.

8.1.2. Installation Objectives

As described in Section 6.1, Fort Riley's ecosystem is dominated by grassland but interspersed with wooded areas of varying sizes and densities. That ecosystem facilitates Fort Riley's mission now and as it is projected beyond the life of this plan. Therefore, the objective of this plan is to maintain, the current extent and distribution of vegetation communities on the fort. To that end, Fort Riley will do the following:

- Conduct natural resources management in a manner consistent with the needs of the military training mission.

    - ♦ Manage vegetation communities at Fort Riley to support military training for an indefinite period and to ensure no net loss of training capability in accordance with the Sikes Act Improvement Act of 1997.

    - ♦ Rehabilitate damaged training areas and improve troop training environments so they can sustain training indefinitely.

- Manage vegetation communities at Fort Riley to enhance ecosystem integrity, protect biodiversity, and ensure sustainability.

    - ♦ Maintain the existing Prairie Parkland ecosystem.

    - ♦ Protect soil integrity and enhance soil productivity.

    - ♦ Manage forests for production at a sustainable level.

    - ♦ Manage grasslands to produce hay on a sustainable basis.

    - ♦ Enhance, restore, and maintain habitat quality for fish and wildlife species.

    - ♦ Mitigate unavoidable adverse impacts associated with the military mission.

- Protect water quality and its associated values in Fort Riley watersheds and in watersheds that drain the installation.

    - ♦ Enhance and restore existing wetlands to promote biological functions.

    - ♦ Protect wetlands to ensure “no net loss.”

    - ♦ Maintain sufficiently vegetated buffer strips along all streams and rivers.

    - ♦ Continue to construct hardened stream crossing sites for military vehicles.
- Manage fish and wildlife species to ensure sustainability and protect native diversity.

    - ♦ Ensure compliance with the Endangered Species Act and Kansas Nongame and Endangered Species Conservation Act.

    - ♦ Maintain density and distribution of wildlife species to provide educational, scientific, and aesthetic benefits.

    - ♦ Produce fish and wildlife game species on a sustainable basis to support hunting and fishing recreation at current levels.

- Control wildlife damage and mitigate conflicts between wildlife and humans.

- Maintain an aesthetically pleasing landscape that fosters natural ecosystem functions as much as possible.

- Control noxious plants and pest animals in a manner that supports the military mission, promotes sustained ecosystem functionality, favors native species, and adds to the quality of life of Fort Riley and the surrounding communities.

8.1.3. Natural Resource Area Objectives

Specific management objectives for Rangeland, Forestry, and Fish and Wildlife are described in succeeding sections of this chapter.

8.2. Forest Management

8.2.1. Management Objectives

- Manage the forest ecosystem at Fort Riley to support military training, enhance ecosystem integrity and produce forest products on a sustainable basis.

- Manage forest ecosystems to the character of forests found in this regional ecosystem province, specifically the Prairie Parkland Province.

- Optimize growth, carbon sequestration and health of forest vegetation through prescribed harvests and timber stand Improvement.

- Protect threatened and endanger species habitat conditions.

- Rehabilitate areas by seeding, planting and coppicing forest species.

- Protect water quality by managing riparian buffer strips that capture and filter sediment and chemicals from surface runoff.

- Protect soil integrity and enhance soil productivity.

- Manage for native forest species and control invasive and noxious species.

- Comply with all laws, regulations, and directives and plan requirements.

- Execute the management of this plan according to long-term goals and accepted Best Management Practices for the Flint Hills region.

- Maintain the aesthetics of important and designated scenic and recreational areas.

8.2.2. Forest Summary and History

8.2.2.1. Program Initiation

Professional forest management on Fort Riley began in 1986 with the hiring of the Management Agronomist, who had forestry education and experience and the hiring of a Forestry Technician. Planning level surveys were performed to evaluate the forest condition and extent. A forest type map was prepared in 1986 by contract with Kansas State and Extension Forestry, Kansas State University. Initial efforts began on a forest inventory in 1987 and was completed and analyzed in 1989. Forest management plans were developed in 1988 and 1993 from existing resource data.

8.2.2.2. Summary of Conditions

Fort Riley contains about 16,400 acres of forestland. Forest cover is typically found along the Kansas, Republican and Smokey Hill Rivers; along numerous drainages as riparian gallery forest; and on upland sites in varying canopy densities. Upland forest is found in greater extent on the northerly and easterly aspects. All age classes can be found in woodlands with pole size stands predominating. Most areas are in mixed species with some areas being stocked primarily with chinkapin oak or hackberry. Species composition is generally in transition from an oak and hickory composition to nearly pure stands of hackberry. The primary factor for the species change is due to the lack of disturbance in forest stands, allowing the shade tolerant hackberry to infiltrate from understory to codominance.

8.2.2.3. Historical Interest

Fort Riley has tallgrass native prairie as its primary vegetative cover. These lands during settlement were reported to contain some forest cover. Forestland was probably found in the same general locations as the present time. However, woodland acreage and stem densities were undoubtedly lower. Some areas may have exhibited oak savanna characteristics rather than true forest cover. In the 1906 Annual Report of the Commandant, School of Application, Cavalry and Field Artillery, Fort Riley, Kansas; a major tree planting effort was reported for the increase of the tactical value of the land. The Assistant Forester from the Bureau of Forestry, U.S.D.A. was dispatched to develop planting plans. About 20,000 trees were planted in the southern part of the current installation lands along ridges and below rim rocks in the canyons to provide screening of forces and to provide fuel. The primary trees planted were oak, hickory, hackberry and pine.

8.2.3. Management Strategy

8.2.3.1. Rationale for Management of Forests

The forest condition typical for the Prairie Parkland Province is for relatively open forest stands having low basal areas. Gallery forest and savanna vegetation having the characteristics typical of this ecoprovince provide ideal military training coverage. They also provide ideal habitat for many native woodland dependent wildlife species. Many of the fort's forests have, however, transitioned from a more open forest condition to one of higher stem and understory densities. This successional change to a higher climax stage is

due in large parts to reduced fire pressure on the forestlands from that of the pre-settlement period and general aging of the forest stands.

8.2.3.2. Management for Forest Transition

Forestlands will be managed to encourage the development of historic stand attributes (i.e. an earlier woodland mix). That management will include disturbance of the forests by commercial harvest and timber stand improvement (TSI) to encourage oak and other shade intolerant species. In some areas cool season (spring) prescribed fires will be used to determine if such disturbance can replicate historic stand ecosystems without damaging forest trees and health. Preservation of Real Property value of forests is a secondary goal. Reduction of shade tolerant hackberry and elm densities will not be accomplished by wasted destruction of the property. Maximum use of commercial harvests will be used to return forest stands to lower stand densities having increased oak composition.

8.2.3.3. Management Prescriptions

Specific activities that will be undertaken in each of the fort's hundreds of forest stands to effect the transition of the forests to lower stand densities having increased oak composition will be determined through development of a 50-year Forest Stands Management Plan. The development of the plan is underway and it is expected to be completed in 2003. It will be incorporated as an appendix to this INRMP upon its completion. The long-range nature of the plan reflects the relatively slow process that changing the character of forests is. Description of the slowly occurring transition will also provide better understanding and scheduling of management activities and expected habitat results for fish and wildlife. Wildlife species' utilization of each stand will be expected to change as successional processes occur in the stands.

The Forest Stands Management Plan will consist of prescriptions for near-term (through approximately 2010) management activities within each forest stand on Fort Riley, predicted condition of each forest stand throughout the 50-year period, and forecasted long-term management activities within each stand. Work completed on the plan through June 2001 is field measurement of conditions at 454 randomly (stratified) selected transects throughout the fort's forest stands and some stand surveys through which specific characteristics and boundaries of individual stands are measured. Analysis of the data collected at the 454 transects is underway and is projected to be completed during late-2001. The results of the analysis will be incorporated into the plan as a Forest Ecosystem Inventory that will provide an overall view of the current conditions of the fort's forest resources.

The prescriptions for management activities that will be described in the plan will identify the management needed to accomplish the desired transition. The preferred year(s) to accomplish each management activity listed in the prescriptions will be identified in the individual prescriptions. The DES Conservation Division's foresters and wildlife managers will develop the prescriptions collaboratively to ensure that the actions called for in them don't adversely affect the fort's wildlife resources. Specific information that will be provided in the prescription for each stand is described in Section 8.2.4.1.

8.2.4. Management Prescriptions

8.2.4.1. Description of Prescription Format

Each forest stand's prescription will contain a description of the stand, goals and objectives, military usage, soil conditions and erosion control requirements, wildlife benefits and enhancement actions suggested, archeological considerations, special invasive plant control efforts required, appropriate methods of harvest, logging activity, future management actions, and other related program benefits. Habitat Suitability Index Models will be reviewed and calculated to determine habitat conditions at various points in time for specified species. Stand maps will be attached to the prescriptions to identify specific locations of the stand and points of reference. The Events Report section of each prescription will provide historic data brought forward through time. The historic data is necessary to analyze the effects of past events on the stand for improved prescription evaluation and modification. As a complimentary monitoring document, a spreadsheet or database will be used to provide a quick reference and reminder when specified management activities are scheduled.

8.2.4.2. Prescription Implementation

Although the prescriptions for all of the hundreds of forest stands that exist on the fort will not be completed until 2003 (Section 8.2.4.3), those prescriptions will be developed incrementally between now and 2003. As they are completed, the stands to which they apply will be put under the management called for in the prescriptions.

8.2.4.3. Timber Stand Improvement (Pre-commercial)

Timber Stand Improvement (TSI) provides a method to protect forests from attack by insects and disease by maintaining optimum health. TSI also ensures proper growth of forest stands that increases carbon sequestration to high levels. The original forest inventory identified approximately 1,200 acres of forestlands where TSI was needed. Additional areas of 270 acres have been identified as requiring some TSI operations. A total of 650 acres TSI was accomplished between FY 1986 and FY 1998. TSI and thinning are done in conjunction with the Fuelwood Program.

8.2.5. Commercial Forest Products and Markets

8.2.5.1. Veneer and Lumber

Fort Riley has a limited number of markets and associated forest products that are produced. Local markets are primarily for sawtimber with a minimum tree DBH of 14 inches. The most valuable forest product on Fort Riley is hardwood veneer with black walnut commanding the highest value. Other hardwoods such as oaks, ash and hackberry are also sought out for veneer. Higher valued veneer logs and some sawtimber is sold to markets as far as Missouri, Nebraska and Iowa. Lower value sawlogs are routinely bought by local saw mills and individuals. Product conversion of Fort Riley logs is typically to fine furniture and paneling veneer, furniture and construction grades of lumber, pallets, and other specialty items. Numerous other species are frequently found on forested areas of

Fort Riley and are usually marketable either as sawlogs or fuelwood. These include the following:

honey locust
Kentucky coffee-tree
bitternut hickory
osage orange
red mulberry
American sycamore
chinquapin oak
American basswood
eastern cottonwood

8.2.5.2. Fuelwood

Both commercial and non-commercial fuelwood is sold on Fort Riley. Commercial fuelwood is sold to local venders through salvage sales for resale. Non-commercial fuelwood is sold through a permit system on post, to be utilized by the permit holder only. The fuelwood sales program provides an orderly system for the use and disposition of fuelwood. The program also improves the timber producing capability of Fort Riley's woodlands, while reducing the accumulation of cutting residues which present fire hazard potential to the forest. Fort Riley Regulation 200-3, March 9, 1998 authorizes the selling of fuelwood permits. Permits are sold through the Directorate of Community Activities (DCA). The permits are for dead and down wood only. Standing timber is not sold under these permits.

Timber Stand Improvement and thinnings are done in conjunction with the fuelwood program. Areas with good access are identified for fuelwood cutters. An area has been established as a wood yard in which wood on the improved grounds is dropped off and is available to woodcutters. That yard is located south in Camp Funston. Open fuelwood areas in the post's training areas are coordinated through G3/DPTM Range Control and the DES, Conservation Division.

8.2.5.3. Other Products

Other products harvested within the forest include morel mushrooms, nuts, berries and wildflowers. No fees are charged for these products and the daily per person harvest can be no greater than what will fit into a container the size of a three pound coffee can.

8.2.6. Method of Product Disposal

Two primary means of commercial product sales are available to Fort Riley. The Kansas City District of the Corps of Engineers will sell timber identified in a Declaration of Availability. The installation has sold timber through the Corps of Engineers three times in the past. Most timber sales occurring on Fort Riley are sold through local authorization. Prior to 24 June 1995 only small sales could be sold through the installation. A reengineering action was approved at Forces Command that gave local authority for sales to the installation regardless of sale sizes. Timber sales are not required to go through the

Corps of Engineers, no matter what the size or value of the sale. All presale marking, contractor coordination and post sale inspections and work are provided by installation personnel. Local sale administration is therefore more efficient and cost effective. Local timber and fuelwood sales administration has been delegated by the Commander to the DES, Conservation Division. Trained professional staff provide technical preparation and coordination of timber disposal actions.

8.2.7. Harvest Cycle and Methods

Harvest cycles will vary depending upon site quality and productivity, species occurring on the site, and the type of silvicultural system used in harvesting the timber. Harvest rotation may occur from 50 - 100 year cycles depending on site quality. Four black walnut plantations have been designed for a 60-year harvest cycle. However, site productivity may extend the harvest cycle to 70 years. If selection harvests or the shelterwood methods are used in cutting units, another timber harvest can take place 10 years after the prior harvest. This will allow regeneration to be established and protected, while obtaining a second harvest on the site.

8.2.7.1. Sanitation Harvests

Sanitation harvests are conducted to reduce the spread of damaging organisms to the residual stand. Sanitation cuttings may also be undertaken in anticipation of attack in attempts to forestall the establishment of damaging organisms.

8.2.7.2. Improvement Harvests

Improvement harvests are made in a stand older than the sapling stage, usually to start improvement of wild stands being placed under management. It involves the removal of only those unwanted trees that are sufficient in size to provide the material for products. Types of trees removed, in addition to undesired species include: diseased trees, those mechanically injured, unthrifty trees likely to die before the next harvest cycle, insect infested trees, and those of poor form. Improvement harvests and thinnings are usually concurrent operations. Timber Stand Improved Areas will be used for the fuelwood program.

8.2.7.3. Salvage Harvests

Salvage harvests remove dead or injured trees to utilize them for timber before they become worthless. Timber will be salvaged following storm blowdowns, ice damage, severe fires, attacks by insects or diseases as well as damage by military training and construction. If extensive areas are damaged, those trees most likely to live will be left for seed trees. Standing dead wood and snags will be examined for wildlife habitat potential prior to cutting. The more valuable habitat snags should be left uncut if no safety issues are apparent.

8.2.7.4. Regeneration Harvests

Regeneration harvest is a general term for the removal of financially or physiologically mature trees in contrast to cuttings that remove immature trees. Regeneration harvests remove trees intended to assist regeneration already present.

8.2.7.5. Seed Tree Harvests

Seed Tree Harvests incorporate the removal of all trees except for selected seed producing trees of the featured species. Seed tree silviculture is of value on military installations when areas of forest must be cleared for use as new firing ranges and impact areas, motor parks and bivouacs. Seed trees remaining during man-made modification to the topography may produce seedlings of desired species that will result in a new timber crop after the period of other use is over. Seed tree value is indicated by the number of seedlings around the tree. The seed trees may be left standing singly, or in groups of 5 to 8 where soil characteristics produce windthrow conditions. If groups are used, as many as 3 to 8 groups per acre and trees greater than 8 inches in diameter will normally be left.

8.2.7.6. Patch Harvests

A patch harvest is used on forested areas where uneven aged stands are targeted to create higher diversity. A patch harvest may range from two to around ten acres. The first priority of a patch harvest is to take areas of injured or overmature trees to allow the establishment of regeneration. Patch harvests allow shade intolerant species to regenerate the area without opening a large area in the woodland. Other patch harvest uses are where stands are growing on soils that are subject to windthrow if exposed by the cutting of larger or adjacent areas.

8.2.7.7. Selection Harvests

Selection harvests of mature timber removes single, scattered trees or small groups at relatively short intervals. This harvest is used along stream side management zones and for the removal of a single species within a stand such as black walnut. This method harvests trees at their highest economic potential. Most of the historic harvesting on post was done in this manner.

8.2.7.8. Shelterwood Harvests

Shelterwood harvests occur in three or more removal stages. This method benefits regeneration by providing shelter to seedlings from radiation and desiccation particularly on drought stressed sites.

8.2.7.9. Silvicultural Priorities

The Fort Riley Management Agronomist, in developing a sustainability harvest budget, considers silvicultural priorities as well as other practical limitations. Other considerations include available funding, manpower for the sale layout, administration, access, market prices and locations, seasonal factors, available seeding and planting stock for restocking of harvested areas and so forth.

Priority 1. Sanitation harvests are usually conducted where an infestation is located. The type of operation should be directed by a professional forester with input from a pathologist or an entomologist when needed.

Priority 2. Salvage harvests remove merchantable dead or dying timber before they become worthless.

Priority 3. Regeneration harvests at Fort Riley will be seed tree, patch, selection or shelterwood harvests, whichever method is most applicable to the stand regeneration requirements.

Priority 4. Improvement harvests (TSI) are in stands below rotation age, designed to improve the stand for accelerated merchantable growth.

Decisions on the area and volume of each stand to be harvested incorporate consideration of the priorities noted above, the stand's condition, available volume, and accessibility.

8.2.8. HarvestSustainability

The average allowable annual cut for forest sustainability is based on data obtained from forest inventories and does not include off-limit areas. The Black Hills Formula was applied to the forests at Fort Riley. This formula recognizes two broad classes of merchantable timber: (1) mature stands in which it is presumed current mortality equals increment, and (2) thrifty merchantable stands making net increment. The total average allowable annual cut is 205,290 board feet. The allowable annual cut will vary in response to weather, the market for wood materials, training activities and other factors that affect the volume of wood that is available, accessible, or in demand.

8.2.9. Integration with the Military Mission

Fort Riley's forest management program is required to support and enhance the immediate and long-term military mission per Army Regulation 200-3, Chapter 5 (*Forest Management*). Forest management at Fort Riley directly sustains a viable and diversified training land through soil and water conservation (including soil erosion control), particularly along riparian corridors, and noise abatement. Planned forest management activities are coordinated with training and operational personnel, including ITAM, as well as with other natural resources management staff.

Fort Riley's program is broad-based to optimize military training. For example, establishing new tree plantings and restoring degraded plantings have provided tactical concealment. Many tree plantings have been installed to restore cover after soil borrow projects were performed by the military. Timber harvest and timber stand improvement are used to expand and enhance access for military equipment. Areas for thinning and harvest also have been provided to Engineering units for chainsaw training. Trees have been provided at times for the construction of defensive positions.

Fort Riley ecosystem-based forest management supports the military mission through compliance with applicable federal laws. Sustaining forest lands also indirectly supports state laws such as the Kansas Nongame and Endangered Species Conservation Act by maintaining riparian corridors along stream supporting the Topeka shiner, a federally- and state-listed endangered species.

8.2.10. Integration with Other Conservation Programs and Recreation

Woodlands exist on approximately 16,400 acres within Fort Riley. Aside from providing forest products, wildlife habitat, recreational opportunities and training facilities, woodlands also serve as watershed protection and erosion control. Forest Management has a direct inter-relationship with fish and wildlife management since woodlands provide valuable habitat for mammals such as white-tailed deer and fox squirrel, and birds such as mourning dove, and northern bobwhite quail.

8.2.10.1. Integration with Fish and Wildlife

Forest Wildlife Habitat Conditions: Forest and savanna vegetation provides habitat niches for associated wildlife species. The Prairie Parkland Province forests and savannas normally occur as linear riparian habitats associated with streams and drainage paths. These cover types contain varying stem and understory densities and cover type widths. Those conditions affect the quality of fauna habitats for some species. Most areas are better suited for forest edge and woodland wildlife species guilds. There maybe areas that contain habitat necessary for interior forest wildlife, specifically interior forest neo-tropical migratory bird guilds.

Wildlife Biological Reviews and Silvicultural Planning: Biological impacts to wildlife are being considered in the development and execution of the Forest Stands Management Plan. Considerations of the habitat quality and extent are considered with regard to the execution of the silvicultural needs of the stands. Use of habitat suitability indices (HSI) for some species is performed to provide understanding of impacts to wildlife. The U.S. Fish and Wildlife Service (USFWS) has developed Habitat Evaluation Procedures for some species that provide the basic evaluation with HSI. Many species have not received study by the USFWS and therefore do not have Habitat Evaluation Procedures from which to quantify possible impacts. The management prescription for each forest stand is developed in collaboration with DES, Conservation Division wildlife managers to ensure that wildlife needs and impacts are considered, balancing the need to manage forest health with the needs of wildlife components of the ecosystem.

Minimizing Forest Management Impacts to Wildlife: Management prescriptions are being developed and conducted on the basis of their effect on the forest in a watershed area. Plan performance on any site within a watershed is done in a cyclic manner, only small areas of the forest vegetation will be affected within the watershed within any year. Specific stands may require some type of maintenance every ten to twenty years, thus creating only a periodic change to habitat conditions. Consequently, there will always be a full range of habitat conditions available within each watershed for specific wildlife niches.

Mapping Avian Productivity and Survivorship (MAPS) Program: The MAPS program is a cooperative project between various partners including the Department of Defense and its Services. Surveys are performed at MAPS sites to provide long-term data on the productivity, survivorship and size of target bird populations. Fort Riley has cooperated with MAPS by allowing six transects to be located on the installation. Three of the sites are located on forested areas in Training Areas (TAs) 2 and 81 and the Funston Landfill area. Three of the sites are on prairie locations TA 24, 39 and 65. Fort Riley has an

informal agreement with the MAPS program to maintain a 984 feet buffer around the transect plots in which no forest management or other vegetative disruption will occur. The term of the MAPS study continues through year 2005. Any silvicultural stand requirements planned or needed prior to that time will be postponed until 2006.

Guidelines. Guidelines for the retention of mast and fruit bearing trees were developed in consultation with the Fish and Wildlife Administrator. The guidelines direct the retention of a minimum of 30 percent of existing mast and fruit bearing trees within a stand. Snags provide essential habitat for a variety of non-game birds and some mammals. Snags that should be retained include:

Snags that are obviously being used by wildlife for nesting, roosting or as a food source
Snags with large enough holes for birds to enter
Snags with many large branches
Snags adjacent to marshes, swamps, lakes and streams
Snags adjacent to meadows, prairies, and forest openings

Generally, almost all snags have some wildlife value. However, some snags are safety hazards. Snags that should be felled are:

Snags that are near enough to roads to fall across them
Snags that are infested with disease or harmful insects that could present a major threat to other trees
Snags that are an extreme fire hazard
Snags that are near troop assembly areas
Snags that are especially hazardous to logging operations

A number of mature trees that are in decline and are scarred, injured and have cavities, but are still wind firm, will be retained in the timber management areas for future snags.

Forested areas further benefit fish and wildlife, maintaining watershed and water quality integrity, serving as windbreaks, and adding to biological diversity. Select timber harvesting, which is deemed to be best suited to the age/species diversity and narrow linear form of woodlands on post, maintains the woodland integrity when conducted in accordance with sound logging practices.

8.2.10.2. Integration with Improved Grounds

Reforestation and other forest management activities can enhance the visual characteristics of the improved grounds on Fort Riley. Woodlands can provide temperate microclimates and protect the watersheds and minimize soil erosion in the area. Substantial acreages of woodland suitable soils exist south of Vinton School Road. These areas exist along the Kansas and Republican Rivers, and along the numerous drainages of the area.

The woodlands offer significant aesthetic values to the improved grounds of the southern portion of the installation. Such woodlands also provide for cooler micro-climate situations in the summer. They serve as temperature moderators in the winter by providing windbreaks.

8.2.10.3. Integration with Range Management

In its natural state, most of the non-riparian land on Fort Riley was rangeland. However, at Fort Riley, shrublands and woodlands have expanded as a result of the historic suppression of wildfires. Maintaining a mosaic of vegetation enhances the multiple use potential of the post. Woodlands, especially along stream sides and on steep slopes provide for watershed protection, and erosion control. Although forestry and range tend to be mutually exclusive, the appropriate blend of ecosystems can provide a healthy environment.

8.2.10.4. Integration with Recreation

Recreational activities such as hunting, hiking, camping and bird watching, which utilize woodlands provide important components to a healthy living environment for humans. When conducted in accordance with installation regulations (i.e. hunting and fishing regulations), recreational activities can utilize the woodlands with minimal adverse impacts to the forest resources.

8.3. Range Management

8.3.1. Objectives

The purpose of this section is to provide guidance for the application of sound, scientific principles for the management of Fort Riley's rangeland resources to support the military mission within a multiple use framework. The overall goal is to protect, propagate, and preserve the bluestem prairie component of the Prairie Parkland ecoregion, and the plant and animal species associated with them. Specific objectives of this INRMP are to:

- Provide a high quality training land resource that meets the needs of the training land users
- Preserve, maintain, and where applicable, restore the prairie community
- Provide plans for long-term and annual management of agricultural outlease programs
- Promote and provide opportunities for non-consumptive use of the rangeland resource by installation personnel and the general public

8.3.2. History

Planned management of rangeland resources is a relatively recent occurrence at Fort Riley. Prior to 1985, range management was supplemental to wildlife management practices. Kansas State University personnel were consulted regarding provisions for prescribed burning and establishment of hay cutting guidelines. In late 1985, a temporary range

technician position was established in the DES, Conservation Division to begin writing the Range Management Plan and to oversee the Agricultural Outleasing Program. This position was converted to a permanent range conservationist in 1987. The first Fort Riley Range Management Plan was completed in 1988. The Range Management Plan was updated in 1994 as part of the 1994 Integrated Natural Resources Management Plan.

Efforts to manage Fort Riley's rangeland prior to 1985 either were not conducted or were conducted solely to increase the production of game animals and decrease the incidence, intensity, and extent of coverage of wildfires. Range conservation efforts at that time were restricted to prescribed burning, maintenance of firebreaks, and brush control. Most of those efforts continue and other programs have been developed to meet the more broad-based requirements currently considered. Today, additional issues including military training scenario requirements, threatened and endangered species needs and compliance with the Clean Water Act are considered during the development and implementation of range management activities.

8.3.3. Management Practices

Range Management is comprised of three primary components. These are prescribed burning, haying and noxious weed control. Section 8.3.3.1 discusses prescribed burning within the context of its role in range management. Prescribed burning as an aspect of overall fire management is discussed in Section 8.15 *Fire Management.* Section 8.3.3.2, *Haying*, contains the discussion of haying, like prescribed burning, as a tool for managing rangelands. Hay leasing as administered through the Agriculture Outlease program is discussed in Section 8.4, *Agriculture Outlease*.

8.3.3.1. Prescribed Burning

Fire is a natural part of grassland ecosystems. Little is known about the frequency of fire in Great Plains grasslands prior to settlement in the mid-1800s because there were few trees to exhibit fire scars. However, Wright and Bailey (1982) suggest that a natural fire frequency of 5 to 10 years seems reasonable. If left unburned, tallgrass prairie declines in both production and species composition (Towne and Owensby, 1984). Prescribed burning is the major tool employed to achieve the rangeland management objectives of this INRMP.

The primary prescribed burning season on Fort Riley is March through early May. Burning during this period promotes the growth of warm season grasses and their associated forb community at the expense of the shrubs, trees, and tame, cool-season grasses interspersed in the grasslands.

The goals of prescribed burning include maintenance of open space for military training, reduction and suppression of woody plant encroachment onto the prairie, reduction of wildfire potential, maintenance of hay quality, and maintenance of wildlife nesting and brood rearing cover. The DES, Conservation Division’s Range Technician drafts an annual Prescribed Burning Plan in collaboration with the Division’s wildlife biologists and forest and pest managers, the Fire and Emergency Services Division, DPW, and Range Branch, DPTM to achieve these goals.

In the Prescribed Burn Plan, areas that have not burned or have burned one year in the last five are designated priority "1" areas, which are generally burned preferentially. Areas burned one or two times in the last 5 years are designated priority "2" areas. These areas are burned only if priority 1 areas are not available for burning. Areas that have burned more than twice in 5 years are, generally, designated as "No-burn/No-firefighting" areas. These areas are not intentionally burned, but if wildfires start in them during the "prescribed burn season", the fires are only fought if people or equipment are threatened. Areas of special concern, such as Henslow's sparrow habitat, are sometimes designated "No-burn" areas. These areas are not intentionally burned, and firefighting efforts to fight wildfires in them are aggressive. Other special use areas, or areas where burning has been requested by a customer, are incorporated into the plan, if burning is compatible with the objectives of the Prescribed Burn Plan.

8.3.3.2. Haying

Haying is another primary tool for managing Fort Riley rangeland that evolved under the influence of numerous large and small herbivores and have developed morphologic and physiologic adaptations to leaf surface removal (grazing). These adaptations also allow native grasses to survive and even prosper under properly managed haying systems.

Haying native grasses is, obviously, an anthropogenic, non-natural influence on the tallgrass prairie ecosystem. It could be assumed to somewhat replicate the influence of the vast herds of natural grazers that existed on the prairie prior to European settlement of the region. Haying, however, is non-specific for the most part. Haying typically occurs in those areas that are accessible, available, and most easily traversed. Hay harvesting removes nearly all above ground vegetation within the cutting area. Native ungulates were more selective, choosing from available plants based on palatability. The major native ungulates, such as bison, wapiti, pronghorn, and others no longer exist in the region in the large, migratory herds. Hay harvesting, when closely regulated, provides a reasonable substitute for native grazing that is compatible with the military mission.

Highest herbage yields from native prairie in the Fort Riley area are achieved by haying on 1 August when compared to haying on the first of June, July, September, October, or November (Owensby and Anderson, 1969). However, research by KSU (Owensby et al., 1970) indicates that haying native prairie in the Fort Riley area during the growing season later than July is detrimental to its vigor because it reduces nonstructural carbohydrate reserves in the crown and rhizomes of big bluestem. For that reason, and because late growing-season haying changes stand composition from one dominated by native, warm-season, perennial, tallgrasses to one dominated by less desirable grasses and forbs, late growing-season haying of native prairies in the Manhattan, Kansas area is strongly discouraged (Launchbaugh and Owensby, 1978).

Many unimproved and semi-improved areas around the Fort's cantonment areas are grasslands dominated by introduced (tame) cool season grasses, principally tall fescue and smooth brome. Those grasses are less sensitive to the effects of late-cutting and/or repeated cutting than are the native species.

The recent spread of sericea lespedeza in many of Fort Riley's rangeland areas, including those harvested for hay, increases the importance of avoiding late haying. Sericea lespedeza is a plant declared noxious in Kansas in July 2000. Removal of viable seed of sericea lespedeza from Fort Riley is a violation of Kansas law although vegetative portions of the plant may be legally removed. Sericea lespedeza typically produces viable seed from early August to the first killing freeze (October 13) and some viable seeds remain on the plant throughout the succeeding winter.

Just as haying of native prairie grasses should not occur too late, haying too early should be avoided too. Haying too early has been shown to adversely affect survival of grassland birds by destroying nests and killing fledglings. Safe dates for haying vary, depending on the species of bird. For example, haying should be delayed until July 15 to ensure minimal impact of the operation on northern harrier and upland sandpiper nesting (Dechanat et al., 1999; Carter, 1992). Even later haying is required to ensure minimal impact on other species such as bobolink, eastern meadowlark, Henslow's sparrow, and ring-necked pheasant (Bollinger et al., 1990; Warner and Etter, 1989; Lanyon, 1995; Herkert, 1999). Haying should begin as late as 25 August to avoid impacting nesting grasshopper sparrows (Dechant et al., 1999). Surveys have not been undertaken prior to haying to determine number of birds or nests that are impacted.

Fort Riley's Land Use Regulations were revised in 2000 to take into consideration both sericea lespedeza and ground nesting birds. A balance was struck on haying dates to avoid, as much as possible, nesting birds but also to avoid the spread of sericea lespedeza by late haying. The fort's current land-use regulations governing haying allow areas dominated by warm season grasses to be hayed once each year between 1 July and first Sunday in August. Areas dominated by introduced cool-season grasses that are in and around cantonment areas may be cut twice (if they were first cut before 15 July) between 1 May and 30 September. The same grasses in the post's training lands may be cut once between 1 July and first Sunday in August.

8.3.3.3. Noxious Weed Control

The control of noxious weeds on Fort Riley rangelands differs from prescribed burning and haying in that it is not a tool but an objective. These plant species can interfere with the normal operation and maintenance of the military mission, and in themselves pose a threat to native biodiversity.

The Kansas list of noxious weeds includes bur ragweed, field bindweed, Indian rush pea, kudzu, bush clover, quack grass, Canada thistle, hoary cress, johnsongrass, leafy spurge, musk thistle, Russian knapweed, sericea lespedeza, and multifora rose. These plant species require control by all landowners in the State of Kansas (Kansas Noxious Weed Law, 1 May, 1982 amended 1998). While not all of these species occur on Fort Riley, Conservation personnel constantly keep watch for these species.

A Memorandum of Understanding (MOU) was established between Fort Riley and the Kansas State Board of Agriculture (now the Kansas Department of Agriculture (KDA)) by which the KDA and associated county Noxious Weed Departments will provide support and expertise in the identification and control of noxious weeds on Fort Riley. Kansas State University and the USDA, Animal Plant Health Inspection Service, Plant Protection and Quarantine (APHIS-PPQ) are cooperating in the use of biological control agents for certain noxious weeds.

Aerial and ground spraying of herbicides, mechanical removal (i.e., mowing) and prescribed burning are used to control noxious weeds. Biological controls include release of weevil species to consume the musk thistle in problem areas.

The primary noxious weeds on Fort Riley with known or potential impacts to native prairie grasslands are musk thistle, field bindweed and sericea lespedeza. All occur within hay lease areas on Fort Riley. Other plant species that may, in the future, present noxious weed problems for Fort Riley are purple loosestrife, leafy spurge and tamarisk. Musk thistle is a rather minor threat, as it is easily recognizable and avoidable by hay lessees, and good control has been achieved through biological means. Biological control will continue as the primary means of musk thistle control, with mechanical and chemical control used only on small, highly visible infestations.

Musk thistle is a biennial or facultative annual weed typically associated with disturbed areas. Isolated populations exist on post in grasslands, forest edges, and cropland edges. A biological control program utilizing two species-specific weevils, the head weevil (*Rhinocyllus conicus*) and the rosette weevil (*Trichosirocalus horridus*), has been implemented through the MOU.

Field bindweed is principally a problem on routinely disturbed range sites and turf areas that are improperly mowed to a height less than four inches. On Fort Riley, field bindweed is most often found along tank trails or areas that are scalped by mowing equipment. It also is a problem in firebreak and wildlife food plot crop fields. It is not a significant threat to rangeland areas. Chemical control is the only viable means of bindweed control known at this time. DES, Conservation Division personnel constantly search for new herbicides to control bindweed at lower application rates.

Kansas State University, through a grant from the USDA, initiated a biological control program for field bindweed during the summer of 1993 through the introduction of two insects, the gall mite (*Aceria malherbe*) and a moth (*Tyta luctuosa*). The gall mite forms galls within field bindweed, reducing plant vigor. The mite overwinters within the roots. The moth also reduces plant vigor by eating the leaves of the field bindweed during the moth's larval stage.

Sericea lespedeza poses a substantial threat to native biodiversity and ecosystem integrity. Areas infested with sericea lespedeza do not have sufficient biomass at ground level to allow efficient prescribed burning. Sericea lespedeza seeds can be transported to other areas of the installation, or off-post, in hay harvested during the late hay cutting

period (1 October to 15 December). As such, hay harvesting during that period is prohibited under the new lease terms . A Memorandum of Understanding with the Kansas Department of Agriculture requires all hay harvested during the late hay cutting period be inspected for sericea lespedeza prior to harvest. DES, Conservation Division and Riley and Geary County Noxious Weed Department personnel conduct these inspections.

At this time, there is no known biological control for sericea lespedeza. Efforts by outside agencies to find a biological control will be supported, where possible. Cultural control, specifically grazing by goats, has proven effective when combined with chemical control. This method is not, however, considered to be an acceptable control means on Fort Riley at this time. The DES, Conservation Division is conducting small-scale trials with various types and rates of herbicides to find an efficacious chemical control method.

The DES, Conservation Division has contracted for the preparation of an Environmental Assessment to conduct aerial application of herbicides for the control of sericea lespedeza. Aerial control of lespedeza is the only effective means of controlling this rapidly spreading weed, due to the roughness of the terrain. Ground spraying equipment cannot adequately traverse areas of infestations, and local contract applicators are unwilling to apply pesticides on most areas, due to equipment damage caused by the terrain. It is known that aerial applications will adversely affect some desirable broadleaf plant species. However, failure to control sericea lespedeza is likely to lead to large areas of sericea monoculture. This condition will lead to reduced wildlife habitat and lowered biodiversity, as well as violations of the Kansas noxious weed law.

8.3.3.4. Control of Undesirable Woody Vegetation

Trees are the most common type of undesirable woody vegetation that have invaded grasslands where they are unwanted. Tree removal is performed annually with each area receiving removal in cycles of approximately 10 years. Sometimes scattered tree removal is accomplished by conducting a prescribed burn through the area during the late spring or summer months when burn temperatures are sufficient to kill the tress. This technique is used especially with younger trees that are returning to a previously cleared grassland area.

Invasion of brush into grasslands and "go-back" areas is another grassland management problem. Techniques used to control undesirable woody and shrub vegetation include spot application of herbicides, mechanical control, and prescribed burning. Brush includes shrubs and trees considered undesirable from the standpoint of planned use of the area. Some trees outside of the woodlands are considered useful for tactical concealment during military training exercises. Consequently, control of brush is not generally practiced except as a secondary effect of prescribed burning of the grasslands, or to modify wildlife habitat. In those limited instances where brush control is determined to be warranted, an integrated approach using a combination of techniques such as mechanical removal, chemical application and prescribed burning should be employed.

8.3.3.5. Native Grass Plantings/Restoration

Warm season native grass plantings and restoration is undertaken by ITAM (see Section 8.12 for detailed discussion) or by DES, Conservation Division as specific wildlife habitat management initiatives (see Section 8.5.1).

8.3.4. Integration with the Military Mission

Range management is critical to the sustainability of Fort Riley's training lands. As stated previously in Section 1.2, *Goals*, cost effective stewardship of the environment is a "Key Support Process" identified in Fort Riley's Organizational Self-Assessment (2000). Range management practices meet Natural Resources Stewardship goals, and support installation objectives of enhanced Training and Operational Readiness and Quality of Life. Range management is the nexus among these goals and links DES, Conservation Division with DPTM's ITAM program. In particular, range management is integrated into the military mission by ensuring no net loss of training lands, minimizing impediments to training and rehabilitating vegetative communities. The application of practices such as prescribed burning, brush removal and noxious weed control support the integrity of the native tallgrass vegetation community. A vigorous vegetation community reduces erosion of training lands and supports realistic military training requirements.

8.3.5. Integration with Other Conservation Programs and Recreation

8.3.5.1. Integration with Fish and Wildlife

Range land is the dominant ecosystem in terms of acreage in northern Maneuver Areas. Maneuver Areas present numerous opportunities for integration of fish and wildlife, and range management activities. The mosaic of vegetation in this area as a result of go-back land, native grassland, woodlands, and shrublands provides excellent habitat for a diversity of wildlife species. Woodlands exist primarily in the loamy lowland range sites associated with the major streams and tributaries.

The creation of new food plots has caused the loss of both native grasslands and "go-back" fields. The Fish and Wildlife Administrator has the primary responsibility for choosing the location of future foodplots. The criteria used in selecting sites included proximity to other habitats, which provide cover for game birds, and soil productivity. The Fish and Wildlife Administrator will consult with the Range Technician and archeologists when selecting new food plot sites in order to avoid native grasslands, good quality "go-back" fields and archeological resources. New foodplots will be directed toward more disturbed sites to reduce the loss of good quality grasslands.

Range management activities that have the greatest impact on wildlife are prescribed burning, haying, noxious weed control, and woody vegetation (brush) control. Timing is the most important factor regulating plant response to burning. Late-spring is the best time for burning native grassland but this may be detrimental to some ground-nesting birds and other wildlife and reduces forb populations that wildlife require for food. Early-spring burning will allow more forbs to grow but often reduces soil moisture and forage

production. Patterns of different aged burns may represent the best situation for a diversity in range wildlife species.

Potential conflicts between wildlife and range management in regards to haying time may need to be resolved on a case-by-case basis. Broadcast use of herbicides for noxious weeds and brush control could pose a negative impact on wildlife food and habitat. With the implementation of a good noxious weed program which utilizes biological controls; it may be unnecessary to broadcast spray after a few years. Scattered plants can be controlled by spot spraying or hand digging. Spot treatment of brush with herbicides poses limited danger to wildlife. Removal of trees on rangeland used by raptors reduces predation on prairie chickens.

8.3.5.2. Integration with Forestry

Most of the non-riparian land on Fort Riley was rangeland prior to settlement by Europeans. However, at Fort Riley, shrublands and woodlands have expanded as a result of the historic suppression of wildfires. Maintaining a mosaic of vegetation enhances the multiple use potential of the post. Woodlands, especially along stream sides and on steep slopes provide for watershed protection and erosion control. Although forestry and range tend to be mutually exclusive, the appropriate blend of vegetation communities can provide a healthy ecosystem.

8.3.5.3. Integration with Improved Grounds

The incorporation of rangeland within the improved grounds can improve aesthetic appearances and reduce maintenance costs. Some income may be derived from hay lease programs in, and adjacent to the improved/semi improved areas south of Vinton School Road. There are sizable acreages of hay ground in the vicinity of the cantonment areas and some hayable area still exists at Marshall Field.

8.3.5.4. Integration with Recreation

The integration of fish and wildlife management with range management can enhance the recreational value of the range. Bird watching of native grassland species is a recreational pursuit sought by many individuals. Specifically, many bird watchers seek out prairie-chicken leks for observation. Another popular pursuit is photography and picking of prairie wildflowers.

8.4. Agriculture/Grazing Outleases

The agricultural outlease program was initiated on Fort Riley in 1966 with two leases on 171 acres. Clearly, outleasing is compatible with the military mission because most of the installation has been leased at some time since 1966. Currently, 48,165 acres in 25 units are leased for hay, and just over 1,500 acres are leased for crop production in 10 units during the five-year, 2001 – 2005 period. Exhibit 8.1 on the next page shows the Agriculture leases and associated wildlife food plots. A list of leases, acreages, and 1999 and 2000 revenue is in Appendix D, Table 1.

The agricultural outleasing program generated more than $91,000 in revenue in 1999 and $56,000 in 2000. Revenue from leasing was reduced in 2000 because two of leases were allowed to expire for that year as part an initiation of a renewal process.

Leases typically run for five years, unless terminated by the Government for convenience or default, or by the lessee. The Kansas City District, U. S. Army Corps of Engineers, issues and administers the leases, and the DES, Conservation Division, manages them on Fort Riley. The Corps began a non-competitive renewal process for some Fort Riley leases in 2001. Half of the leases that expired in December 2000 were offered to the current lessees for an additional 5-year period for a renegotiated rental fee. This process resulted in renewing 14 of 15 leases eligible for renewal. This new option may initiate a greater sense of stewardship in the lessees and encourage them to invest more effort in maintenance activities such as weed control.

8.4.1. Haying

The mechanism to accomplish extensive haying is through leasing tracts of Fort Riley. The grasslands of Fort Riley that are not inside the Impact Area or the danger fan for the MPRC are leased for hay harvest. See Section 8.4 *Agriculture Outlease* for a discussion on the administrative aspects of leasing. Most of this hay harvested is from areas dominated by native, perennial, warm-season grasses.

Fort Riley Land Use Regulations establish hay harvesting dates for the lessees. The Fort revised its land use regulations governing haying in 2001 and beyond to better provide for the needs of nesting birds and reduce the possibilities of removing noxious weed seed from Fort Riley. Most areas dominated by native grasses will only be cut once each year between 1 July and the first Sunday in August. In addition, haying areas with size, species composition, and spatial characteristics making them especially attractive to grassland dependent birds for nesting sites will not be hayed until 15 July of each year.

Haying grasslands that are in and around the Forts cantonment areas and are dominated by cool season grasses will be from 1 May to 30 September, if the grassland is not infested with sericea lespedeza. If it is infested, the lessees will only be allowed to hay the area from 1 May to the first Sunday in August. In either case, no limitation will be placed on the number of times each year during the allowable cutting periods those areas may be hayed.

Grasslands that are dominated by cool season grasses and that are not in and around the fort's cantonment areas may be cut once only each year between 1 July and the first Sunday in August. Harvest of grass seed and/or forb seed by lessees will no longer be allowed, although the fort may cut seed or contract for seed to be cut on a case by case basis from areas determined by DES, Conservation Division personnel to be free of sericea lespedeza.

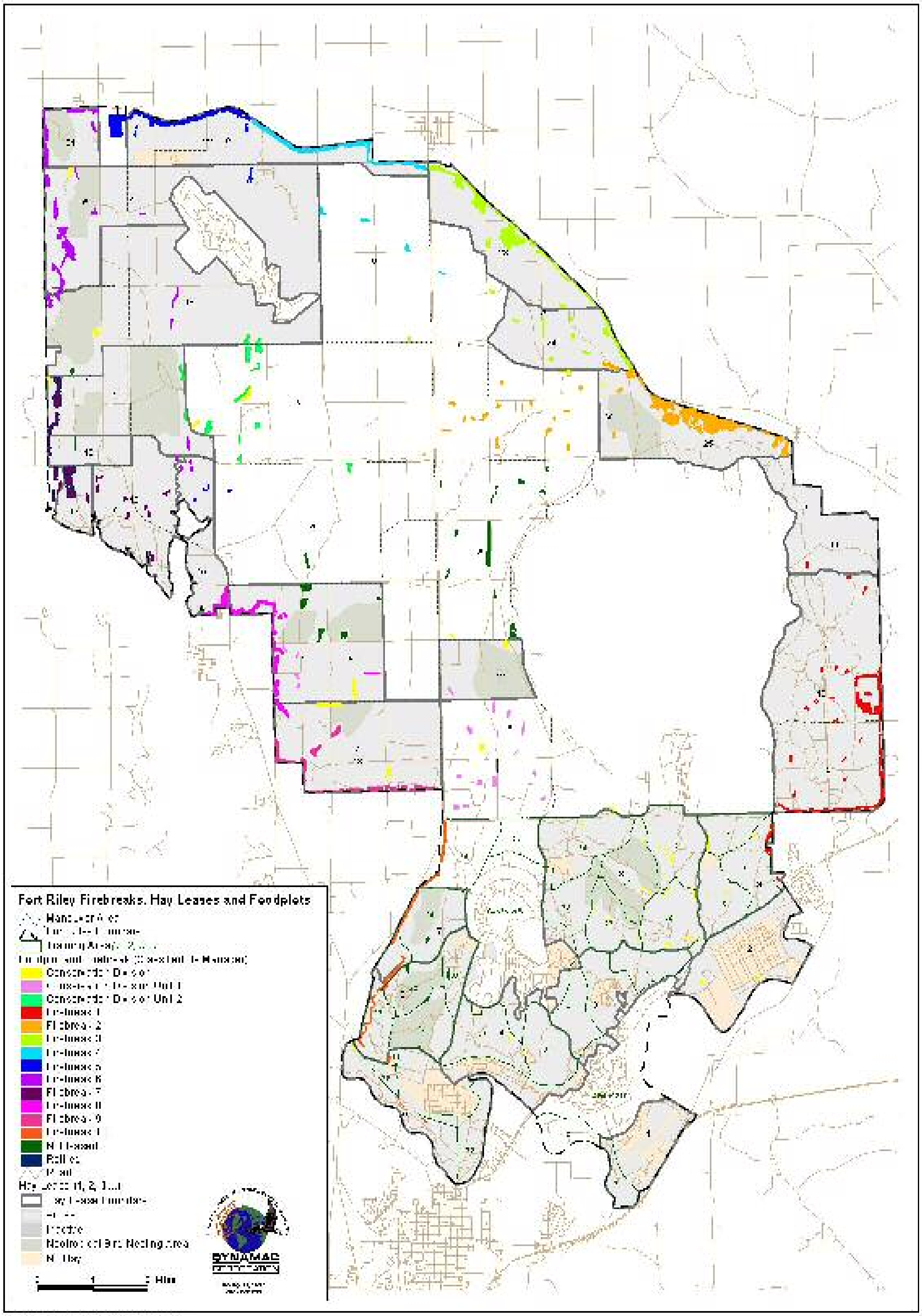

Exhibit 8.1

The harvest dates specified in the Land Use Regulations must be enforced to maintain a quality training land resource, to protect the fort's native wildlife and for Fort Riley to comply with Kansas's laws governing control of noxious weeds. Thus, extensions of hay cutting dates must not be granted for any reason. Command Group support for this policy must be obtained and maintained as long as sericea lespedeza remains a problem on Fort Riley. Lessees may have valid reasons for needing more time to cut hay. However, the impacts to the native grasses and grassland-dependent birds, and the legal ramifications of sericea lespedeza management, outweigh those needs.

8.4.2. Firebreak Cropfields

A firebreak system has been established around the post's perimeter to minimize wildfire spread off the post onto adjacent privately-owned lands. Nearly 1,500 acres along approximately 44 miles of the boundary are leased for crop production such as corn, soybeans, and grain sorghum. The firebreak varies in width from approximately 150 feet to in excess of 300 feet. Vegetation growing on that firebreak is mechanically destroyed annually by tillage activities. In areas where the soil is not arable because of severe slopes or rocky conditions, a crawler tractor-pulled disc accomplishes that tillage. Ten lease units comprise the arable areas of the firebreak. Row crops and cereal grains are grown and harvested in these fields within the terms of the land use regulations of leases.

Maintenance of firebreaks by agricultural lessees reduces the cost to the installation when compared to mechanical tillage. Mechanical means using earth moving equipment would cost approximately $200,000.00 annually. Instead, lease rents contribute significantly to the DES, Conservation Division's budget and mission.

Under the terms of the firebreak cropfield leases, row crops and cereal grains may be grown but normally no more than half the width of each field may be planted to cereal grains. Regardless of what is grown, at least eight rows of row crop grain must be left unharvested in each field throughout the winter to provide food and cover for wildlife, and the field must be maintained in a condition which will inhibit the spread of fire. Additionally, lessees are required to plant, in specified locations, wildlife food plots that must be left unharvested throughout the winter.

Wildlife food plots in the agricultural outleasing program consist of approximately 500 acres in plots of 1 to 26 acres. These fields are located throughout the post, including the perimeter of the Impact Area. Lessees receive rental abatement at a rate consistent with the local market rate in return for planting those food plots. For example, the rental rebates in 2000 totaled more than $30,000. The lessees may harvest any grain remaining in the plots the following spring, although typically very little is left for harvest.

Erosion control structures (i.e. terraces and grassed waterways) have been constructed in all leased fields designated as containing Highly Erodible Land by the Natural Resources Conservation Service. Continued reduction of soil erosion from these fields and efforts to stem erosion in the areas not leased will remain a primary concern. Constructed erosion control structures will be protected, maintained and repaired, as necessary, to ensure their continued effectiveness. Lessees are required to plow up terraces each year

to maintain their effectiveness. Furthermore, terraces, silt traps, and waterways should be established as appropriate on areas not leased.

While croplands are not a native part of the tallgrass prairie ecosystem, and the plants contained within them are typically not native (either the crops themselves or weeds associated with the crops), they have become a significant part of the region's ecology. Consequently, native and introduced wildlife species have become accustomed to feeding in croplands. Small croplands, such as those on Fort Riley, contribute to a patchwork arrangement of habitat components, thereby increasing biodiversity.

8.5. Habitat Management

Fort Riley generally practices ecosystem-based habitat management to achieve the overall natural resources objective cited in Section 8.1.2. and those specific objectives cited in Section 8.1.3. The focus of habitat management activities is, normally, to manipulate vegetation and vegetation communities to favor entire faunal communities rather than targeting specific wildlife species. To this end, management activities that change plant succession, alter vegetation composition and arrangement, supplement specific components that may be limited (such as food resources and nesting cavities), and change the physical structure of habitat are practiced. Annual Habitat Management Plans are developed, primarily by the DES, Conservation Division's Fish and Wildlife Administrator with substantial input from the Division's Management Agronomist and Range Technician to provide a framework for habitat management as well as to establish specific prescriptions. These plans are updated annually and are on file at DES, Conservation Division.

8.5.1. Terrestrial Habitat Prescriptions

Habitat management prescriptions are developed and implemented to meet specific wildlife management objectives. Prescriptions are implemented to provide supplemental feed for wildlife, manage forbs, establish native grass plantings, develop wetlands, remove undesirable woody and brushy vegetation, plant woody habitat plots, conduct prescribed burning, provide nesting and roost structures, and manage wetlands.

8.5.1.1. Supplemental Feeding

Providing supplemental food resources for wildlife is a standard wildlife management practice anticipated to continue through the life of this plan. Past activities included planting wildlife food plots, providing grain dispensers (feeders) for quail and alfalfa hay for elk, and planting mast and fruit bearing trees and shrubs. Planting food plots has been an on-going extensive activity whereas the alfalfa hay was a one-time experiment for elk feeding due to apparent lack of use by elk. Small numbers of feeders were used intermittently for a few years but were discontinued due high maintenance. Planting food bearing trees and shrubs has been a long-term practice incorporated into woodland and woodlot regeneration actions.

Food plots have been planted on Fort Riley since 1961 by agricultural lessees as part of a rental abatement plan for firebreak leases, by DES, Conservation Division personnel, and

by contractors who supply required labor, equipment, and materials. The DES, Conservation Division's Fish and Wildlife Administrator specifies all food plot locations, sizes, plant selection, planting dates, seeding and fertilization rates, and pest control practices regardless of the mechanism employed to provide the plots. The food plot program is continually reviewed to consider modifications to crops and acreages of plots planted, cultural and chemical management practices employed and mechanisms to plant the plots as well as to evaluate wildlife use. Some plots are left fallow and crops are rotated in some others most years. Table 8.1 shows the acreage of food plots planted through each mechanism in recent years. Acreages for 2001 are not included because fall plantings of wheat had not occurred yet at the time of writing this INRMP. However, acreages are anticipated to be similar to 2000.

Traditionally, the plots planted were small (generally less than 1 acre), and most were planted to grain sorghum (milo). In recent years, the small milo plots were stripped of seed, primarily by deer, by early winter. This observation was verified by research conducted by KSU, Division of Biology (Richardson, 1994, unpublished data). As a result, the size of many of the plots has been increased, and greater emphasis has been placed on planting a variety of plants and otherwise managing the plots to reduce their use by deer to make food available in them longer. Alternative plants include forage sorghums, sunflowers, corn, soybeans and other legumes, and millets. That emphasis is expected to continue throughout the plan.

Table 8.1. Food plot acreage on Fort Riley and mechanism employed for planting the plots.

Year	Contracted	Agriculture Lessees	In-House	Total
2000	137	340	203	680
1999	137	394	203	734
1998	137	394	203	734
1997	137	357	181	675
1996	137	338	101	576
1995	137	345	60	542

Most food plots on the fort are planted to benefit as wide a variety of wildlife during the winter as possible while meeting the needs of bobwhite quail. Therefore, most of the food plots are juxtaposed adjacent to woody habitat components (e.g., brushy areas). A few are planted each year away from woody habitats to increase their attractiveness to greater prairie chickens.

Some of the plots are planted for more limited purposes. For example, wheat is planted in some plots, principally to provide a green, highly palatable forage for elk prior to green-up of native vegetation to reduce depredation of wheat fields on nearby private lands. Some of those wheat plants are subsequently managed to provide enhanced dove

hunting opportunities, as are some sunflower plots. Management of these food plots for dove hunting conforms to the USFWS regulations pertaining to migratory bird hunting promulgated under Title 50 Code of Federal Regulations, Part 20.11. Alfalfa plots are planted to enhance brood habitat for wild turkeys and bobwhite quail, though deer, elk, and rabbits also graze on these fields.

Some supplemental feeding programs have been experimental or narrow in scope. For instance, 23 tons of alfalfa hay was purchased to feed elk in 1996 to determine whether the alfalfa would "hold" the elk on post to minimize depredation of winter wheat on adjacent private lands. Use of the alfalfa by elk was sporadic and intermittent and did not appear to decrease elk dispersal off-post. Consequently, that practice is only likely to occur in the future if Fort Riley experiences sustained snow cover more than a few inches deep. A supplemental feeding program for bobwhite quail in which simple tube feeders and "quail feed blocks" were strategically placed in selected quail habitat was undertaken in the late-1980s. Although quail did use the supplemental feed, the practice has not been repeated in recent years because of the maintenance requirements it entails. The practice may, however, be implemented again, particularly during years of severe winter weather.

8.5.1.2. Forb Management

Annual and perennial forbs are important components of wildlife habitat, and these species occur naturally and are widespread. Annual forbs such as sunflowers, ragweeds, pigweed, and Korean lespedeza are important food and cover sources for many game and non-game species. Perennial forbs such as roundhead lespedeza, partridge pea, and alfalfa, also are valuable to many species.

DES, Conservation Division personnel have planted non-native forbs (principally alfalfa and Korean lespedeza) in selected areas specifically for erosion control, to enhance brood habitat for upland game birds, and/or to provide food for upland game birds and mammals. These forbs will continue to be planted.

Growth of annual, native forbs is encouraged by virtually any practice that disturbs the soil's surface at the appropriate time. On Fort Riley, the need to disturb areas to promote growth of annual forbs is not great since military activities disturb much of the installation each year. The DES, Conservation Division has disturbed some sites in the past to allow annual plant growth. Disking, for example, has been a common method employed by the DES, Conservation Division for soil disturbance, and light plowing has been infrequently used. This practice will be continued selectively.

Prescribed burning of grasslands during the early spring stimulates growth of perennial forbs, which will be considered in the annual prescribed burning plan (Section 8.3).

8.5.1.3. Native Grass Plantings

Planting native grass on Fort Riley is limited in scope. It mainly is conducted to replace cover lost during construction activities or as a result of maneuver damage of specific sites. Attempts to convert large areas dominated by introduced grass species or other plant communities to ones dominated by native grasses by planting native grasses is not

practiced except in a few instances. The greatest acreage of native grass plantings on Fort Riley has been completed as part of the closure or repair of landfills. Both the closed Custer Hill and Southwest Funston Landfills have been planted with native grasses.

Other native grass plantings have been accomplished by DPTM, ITAM personnel after filling in abandoned hull defilades, foxholes, and other maneuver damage sites and by DES, Conservation Division personnel to meet specific wildlife management objectives. For instance, native grasses have been planted to provide wildlife nesting habitat adjacent to wetlands (both existing and created wetlands), to enhance cover near wildlife food plots and in firebreak cropfield waterways, and to reduce non-point source pollution of Topeka shiner habitat. Native grasses will continue to be planted for similar purposes during the life of this plan.

8.5.1.4. Removing Undesirable Woody Vegetation

This section specifically addresses removal of undesirable vegetation from grasslands and woodlands within the context of habitat management**.**

Removal from Grasslands. Scattered trees and brush are removed from grasslands and other areas to improve habitat for selected species. Scattered trees are removed from grasslands to favor certain grassland birds such as the greater prairie-chicken and Henslow's sparrow, and brush comprised mainly of shrubs such as American Plum and rough-leafed dogwood, is removed or thinned in selected, localized areas where it is over-abundant relative to other habitat components. Unwanted trees and brush are removed by three principal methods; prescribed burning (Section 8.17), direct removal and herbicide application. Each year, scattered trees are cut in selected grassland tracts with each tract being cut on an approximately ten-year cycle. Combinations of rotary mowing, disking, and spot applications of herbicides are employed to remove unwanted brush. In most cases, brush removal has been followed by localized planting of native grasses, forbs, or agricultural (foodplot) crops.

Removal from Woodlands. Trees determined inferior due to their health status, form, and/or species are removed from woodlands through Timber Stand Improvement (TSI) practices. TSI is practiced to allow the healthier trees and the trees with greatest wildlife and/or economic value in existing stands better opportunity to use site resources and to thin overcrowded stands of valuable sapling to pole-size trees. Thinning and other TSI projects are performed by mechanical and/or chemical removal of existing trees. Fort Riley generally allows cutting existing trees wherever access is sufficient to allow fuelwood cutters the opportunity to gather the wood. DES, Conservation Division personnel perform some of that felling and the other is accomplished by commercial loggers who remove saw logs and, generally, leave the tops of felled trees. Where access is poor for fuelwood consumption or where standing snags are desired, unwanted trees are killed by herbicide (usually glyphosate) injection.

8.5.1.5. Managing Woody Vegetation Plots

Trees are planted outside improved grounds areas to reduce soil erosion, to improve wildlife habitat, or to improve tactical training. In improved grounds areas, they are also planted to enhance aesthetic value of the fort. Other benefits result from planting woody vegetation, such as carbon sequestration and production of wood fiber for wood products.

Tree plantings on unimproved grounds started in 1966-1967 in cooperation with the Kansas Forest Service. These plantings were principally black walnut for research and production of veneer logs. Such plantations were established intermittently through 1973. A second period of tree planting began in 1988, since which typically two to twenty acres of trees have been planted each year. Conservation Division personnel planted most of those trees to reclaim locations after soils were mined ("borrowed") from them to support construction projects on Fort Riley.

Since 1988, the species composition of the plantations has been diversified, and while black walnuts are still typically a major component, other species such as bur and chinkapin oak, black and honey locust, crab apples, and eastern red cedar are also planted in most plantations, and cottonwoods are included in some. Plantations will continue to be established during the period covered by this plan. However, most tree and shrub planting will renovate existing hedgerows or increase the width of existing buffer strips along sensitive streams (see below).

Fort Riley entered into a cooperative agreement with KSU's Department of Forestry, Horticulture and Recreation in 1993 under which the University planted and maintains 12 acres of trees in Training Area 1. Half of the area was planted with various genotypes of black locust to evaluate their use for reclamation planting. The other six acres were planted for agro-forestry research. The purpose of the latter planting is to evaluate the inter-cropping potential of trees with agricultural crops. In that planting, interior rows of black walnut and exterior rows of other species, which were planted to increase the height growth of the walnuts, were established between strips that are annually planted with agricultural crops by Conservation Division personnel. The inter-cropping system also provides improved conditions for edge habitat fauna.

Numerous hedgerows of osage orange were planted after settlement and prior to the two principal land acquisitions during 1942 and 1966-1967. Military training, wildfire and senescence thinned and destroyed many hedgerows. Several of the osage orange hedgerows have been renovated in recent years; specifically, parallel rows of trees were planted at five sites. Also, existing trees were cut at or near their bases and allowed to resprout at two other sites. Additional hedgerow renovations, particularly parallel plantings, are also planned. The principal species used for plantings so far include eastern red cedar, honey and black locust, osage orange and various shrubs that benefit wildlife. Although some of these species are exotic and/or may be problematic for prairie restoration, the species are planted to provide concealment for military assets during training. Additional hedgerows probably will be renovated between now and 2005. In some cases, a root plow will be used to increase sprouting of stems from roots of existing trees with, or as opposed to, planting additional rows of trees next to those existing.

Conservation Division personnel planted more than 4,000 trees as well as native grass plantings nine miles of Wildcat Creek in 2000. They were planted to increase the width of the vegetation filter strips between the creek and adjacent firebreak cropfields to reduce the potential for non-point source pollution of the creek, a state designated critical habitat of the Topeka shiner, a Federally-listed endangered species. Additional shrubs and trees likely will be planted along other stretches of Wildcat Creek for the same purpose.

Tree and shrub planting projects require ongoing maintenance for weeding, periodic irrigation, and on some sites, mulching and maintenance of firebreaks. A tractor mounted rotating-head cultivator called a Weed Badger controls weeds within rows, and a rotary mower and/or disc harrow normally controls weeds between rows. Other plantings are seeded to Korean lespedeza, which is periodically mowed to suppress grassy weeds and provide a wildlife food source.

8.5.1.6. Prescribed Burning

Prescribed fires are a major tool to manage wildlife habitat and achieve rangeland management objectives of this plan. The planning and execution of prescribed burning is described in Section 8.17, Fire Management of this plan.

8.5.1.7. Nesting/Roosting Structures

Artificial nesting structures are provided to augment limited natural nesting cavities or sites for purple martins, bluebirds, kestrels, and waterfowl such as mallards, wood ducks, and Canada geese. Most of the nesting structures placed on Fort Riley are waterfowl nesting structures. However, roosting structures for bats have been placed under several bridges on the fort to compensate for losses in that habitat caused by exclusionary screening and other barriers in attics of nearby buildings with resident bats.

Use of roosting and nesting structures is monitored to determine success of the program. Results show bluebird houses, martin houses, and goose platforms are the most frequently used structures followed by wood duck nesting boxes. However, mallard boxes are not used frequently. Bats have not used bat houses extensively.

Roosting and nesting structures will continue to be installed, maintained, and monitored to maintain the number (approximately 50) of bat roosts and bird nest structures through 2005. Goose nesting structures are not considered a biological necessity due to their prolific reproductive capacity. However, these structures do provide a public relations benefit as an example of habitat management using made-made structures.

8.5.2. Aquatic Habitat Management

Aquatic habitat management on Fort Riley has historically been much more limited in scope than terrestrial management. Most aquatic management has been for sport fisheries in lakes and ponds. However, recent management efforts have been to reduce non-point

source pollution into streams by enhancing stream buffers and reducing sedimentation generated when vehicles cross streams away from bridges and culverts.
The fort's objectives for management of aquatic habitats are:

- Reduce sedimentation of streams and decrease their turbidity by installing soil erosion-controlling structures and features such as vegetated buffer strips.

- Prevent unnecessary channeling of streams and protect physical characteristics of prairie streams.

- Maintain the quality of the sport fishery habitat in the 29 lakes and ponds managed in 1999 at or above their 1999 levels.

- Construct or renovate one multi-purpose pond during the life of this INRMP.

- Manage existing wetlands to provide enhanced value for migratory shorebirds and ducks.

8.5.2.1. Pond and Lake Habitat Management

The habitat of the 29 lakes and ponds that currently support a sport fishery resource is managed to improve angling recreation by manipulating habitat to support greater fish populations and/or for increasing angling opportunity. Practices that have been and will continue include placement of structure to provide cover, manipulation of water chemistry, and control of unwanted vegetation.

Conservation Division personnel have installed structures consisting of tire reefs, piles of pallets, and/or brush piles of discarded Christmas trees and red cedars removed during prairie restoration projects. Most structures have been placed in the fort's larger ponds.
Most of Fort Riley's managed lakes and ponds have had excessive aquatic vegetation present at some time(s). Plants have been removed by hand pulling in some cases, but most often an herbicide has been applied to kill or retard the growth of nuisance vegetation. White amur, an herbivorous fish, have also been stocked in some of the ponds and lakes to consume the plants. Excessive aquatic vegetation will continue to be treated by methods that are both approved and most effective.

The presence of trees (usually cottonwood) on pond dams is also undesirable due to the ability of tree roots to undermine and destabilize a dam. Cottonwoods are removed with chainsaws and then an herbicide is applied to prevent resprouting.

Limited manipulation of water chemistry of some ponds has been practiced. Hay bales have been placed in some ponds to decrease water turbidity by binding suspended clay particles. Liquid fertilizer has been used in ponds to decrease water clarity.

Eight ponds have been constructed and two existing ponds have been renovated on Fort Riley since 1986. The construction of additional ponds and lakes as well as the renovation of existing impoundments is expected to continue.

8.5.2.2. Stream Habitat Management

Management of the Kansas, Republican, and Smokey Hill rivers, which form the installation's southern boundary, is extremely limited because flows are substantially influenced by releases from Milford Reservoir. There are no plans to manage habitat in the Kansas, Republican, and Smokey Hill rivers because they are not under Fort Riley's control.

Buffer strips will be maintained along streams that are potential or known habitat for the Topeka shiner. The program will emphasize those areas currently being farmed under the agriculture outlease program. Over the long term, farming has slowly reduced the width of vegetation buffers along some portions of some Fort Riley streams. A systematic program to create, enhance, and repair existing vegetation buffer strips will be implemented according to the installation's ESMPs. Buffer strips, at least 50 feet wide, will be maintained. Grasses, shrubs, and trees will be planted and managed in those buffers as required to maintain their functionality as sediment filtering strips.

Other stream management practices will be considered for the future. For example management activities will continue to minimize and prevent sedimentation in the streams. In addition, cover for protection and shelter could be placed in the streams. Deflectors could also be installed to increase sinuosity; and, lowhead dams could be built to create pools. Finally enhancing fish habitat would increase the fishing potential of all the installation's streams.

8.5.3. Wetlands Habitat Management

Wetlands habitat management is discussed as separate section because these habitats represent an interface between terrestrial and aquatic areas. In recent years, increased national emphasis has been placed on management of wetlands to benefit migratory wading birds and ducks and to protect streams from sedimentation. Wetlands are considered key habitats because of their limited distribution in the Kansas Flinthills.

Wetlands on Fort Riley are managed to produce a diversity of wildlife habitats. Various water level manipulation schemes and vegetation management practices are combined to provide temporal and physical mosaics of wildlife habitat. Some wetlands are permanently inundated whereas others are seasonally flooded. Water level changes may be passive as a result of rainwater accumulation and evaporation or actively manipulated with water control structures. The timing and speed of controlled drawdowns varies as well.

Management practices emphasize the integration of a variety of wetland types to attract different groups of wildlife, particularly migrating wetland-dependent bird species. Moist-soil management, protection of riparian buffer strips, and the placement of waterfowl nesting structures are the primary practices.

Wetlands restoration and creation and specific management practices undertaken and expected to be undertaken in the future are described more fully in Section 8.10, *Wetlands Management*.

8.6. Fish and Wildlife Harvest Management

Game (terrestrial and fish) harvest management on Fort Riley combines an ecosystem approach with harvest control. Ecosystem management influences the availability of game species for harvest. For example, ecosystem management that favors native grasses by reducing invasive brushy vegetation will benefit prairie-chickens but adversely affect ring-necked pheasants. Harvest control substantially influences the number of game animals removed from the population each year.

The KDWP establishes fish and game harvest regulations that are applicable on Fort Riley. Exceptions are listed in Fort Riley Regulations 210-15, the fort's hunting and fishing regulations. In no case, are Fort Riley's regulations less restrictive than Kansas's regulations.

Hunting and angling opportunity, and thus harvest, may be limited because of military training constraints and security measures, safety considerations, and qualitative aspects. Safety is paramount and, in some cases, requires limiting hunter participation. Also, military mission requirements take precedence over all announced hunting seasons. For example, much of the fort has been closed during the peak of upland game bird season because of training each year since 1995. This has meant far fewer hunters participating in upland game bird hunting.

Harvest management is inherently adaptive because human elements are dynamic. For example, goals and objectives may change as a result of changes in military mission, training requirements, customer demand, or Command decisions and policy. Harvest strategies also change depending on game and fish populations. Furthermore, as abundance and density changes, some harvest quotas and bag limits change correspondingly.

8.6.1. Harvest Objectives and Trends

Harvest management objectives are prepared by the Conservation Division's Fish and Wildlife Manager each year to provide a framework for upcoming hunting and fishing seasons. These objectives are based on biological and sociological carrying capacities and desired population dynamics. Annual Wildlife Harvest Management Plans are developed by DES, Conservation Division to provide a framework for managing harvest during the upcoming hunting seasons. These are available at DES, Conservation Division and updated annually.

Fish and wildlife harvest objectives are, generally, based on the fundamental concept of sustained yield. This harvest management strategy considers the production of animals on a sustainable basis to provide a balance of hunting and angling satisfaction and opportunity. Bag and creel limits established by KDWP and further restricted by the

DES, Conservation Division ensure a sustainable harvest of fish and wildlife game species.

Sustained yield is not always the appropriate game harvest management strategy. For example, some lakes within cantonment areas are managed as "urban fisheries" based on a put-and-take concept. Management objectives for these lakes are based on cost-efficient stocking rates that provide sufficient return of stocked fish to the angler. Population control objectives for deer and elk are the priority under certain circumstances. These big game populations are maintained at a self-sustaining level but at one that is far below the biological carrying capacity of their habitat and below levels desired by many hunters to reduce the incidence of deer/elk vehicle collisions and deer and elk depredation of crops on privately-owned lands adjacent to Fort Riley.

8.6.2. Game Harvest

Game harvest is a function of a variety of biological and non-biological factors. The two most important factors on Fort Riley are changes in population size and hunting and angling opportunity as a function of access. Hunter and angler participation is substantially and usually unpredictably affected by access restrictions due to military training. Consequently, establishing of harvest objectives for most game species is not meaningful.

8.6.2.1. Upland Game

Populations of upland game, particularly bobwhite quail, are substantially influenced by weather. Specifically, harsh weather conditions negatively affect over-winter survival and reproductive success resulting in depressed populations. Consequently, fewer birds are available for harvest. Weather also substantially affects harvest of migratory birds because weather patterns influence the timing of migration and thus, the availability of birds. Finally, harvest objectives based on absolute numbers of game bagged is unrealistic and somewhat arbitrary because of weather factors and training access restrictions.

Management of harvest rates (# bagged per hunter-day) are more realistic and achievable. However, harvest rates are used more as "benchmarks" than absolute objectives. Fort Riley wildlife managers follow upland game harvest trends as general means for monitoring hunting recreation rather than for determining whether certain objectives have been met. Long-term harvest trend data collected since the late 1980's are on file at DES, Conservation Division.

Bobwhite quail. Bobwhite quail are the most sought after game species on Fort Riley. In fact, the annual harvest of quail is nearly equivalent to the harvest of all other upland game species combined. Reported harvest ranges from about 600 birds (1972 and 1984) to 6,000 (1973). The average annual harvest during the 1990's was 2,900 birds. The number of quail harvested each year varies greatly but has been declining since 1993 due both to decreasing numbers of hunters and declining quail populations. The installation's quail harvest benchmark is to sustain an annual harvest rate of at least two birds per hunter -day.

A study conducted by Kansas State University-Division of Biology tested whether food plots are population traps for bobwhite quail on post (Madison, 1998). The hypothesis

tested was that quail using food plots have higher mortality rates and hunter-caused mortality than does the control group that did not use food plots. The project used radio-telemetry to determine differential survival rates and cause-specific mortality. This Ph.D. study concluded that quail using food plots did not have more hunter-related mortality than those that did not use the food plots.

Ring-necked pheasant. Ring-necked pheasants are most often taken incidentally to quail hunting although some hunters do specifically seek out pheasants. Annual pheasant harvest on Fort Riley averaged approximately 360 birds during the 1990's. However, harvest substantially declined beginning in 1997 and has averaged less than 200 birds from 1997 to 2000. The installation's harvest benchmark is to sustain a harvest rate of 1 bird per two hunter-days.

The reasons for the declining harvest are probably related to several factors. One of these is habitat change detrimental to pheasants. Specifically, aggressive implementation of ecosystem management principles for grasslands has resulted in fewer invading shrubs and reduced vegetation community types. Additionally, prescribed burning and mechanical removal of shrublands have produced a more homogeneous grassland. Also, haying of grasslands and insufficient cropland area are important factors suppressing the number of pheasants and, therefore, available for harvest. Planting forage sorghum or milo should increase over-winter survival and thus, the breeding population. However, pheasant populations on-post are not expected to be large as long as biologically appropriate, ecosystem based, range management is implemented.

Another reason for declining pheasant harvest is simply fewer hunters in the field during this period of declining harvest. Reduced soldier strength assigned to Fort Riley began in 1995. Secondly, military training during the late 1990's closed much of the installation during the peak of upland game bird season (late November and early December).

Greater prairie-chicken. Prairie-chicken harvests have ranged from 21 to 133 birds between 1986 and 2000. Substantial increase in harvest began in 1989 with an early fall season when broods are most vulnerable to hunting. Thus, the typical harvest tripled after the early season. Since that time, the typical harvest rate has been one bird per 4 to 5 hunter-days. Harvest is substantially influenced by how much and which portions of the installation are open for hunting during the early season.

Management objectives for chickens focus on maintaining population size rather than establishing harvest benchmarks. Fort Riley's management objective is to maintain the post's population near or above its level of 500-600 during the late 1990's and in 2000. Ecosystem management of the installation's over-all grassland condition is key to accomplishing this goal.

Spring lek surveys indicate the breeding population's size has been relatively stable, which contrasts to populations in the remainder of the state. Throughout the state, prairie management is conducted primarily for livestock, and some of these practices are

detrimental to prairie-chickens. In contrast, Fort Riley range management practices do not include livestock and thus, favor prairie-chickens.

Mourning dove. Until recently, little effort has been expended to encourage harvest of mourning doves. Recently, however, the post has placed greater emphasis on encouraging that activity. Food plots have been planted and managed to attract and concentrate doves during their open season. The resident birds combined with flocks migrating from northern states can provide good hunting during September and into early October. Of course, annual harvest fluctuates greatly because weather patterns affect the timing of migration and thus, the availability of birds for hunting. Consequently, no harvest benchmarks are established for doves on post.

Cottontail rabbit. Fort Riley's hunters report taking about 225 cottontails each year during the 1990's. Most are taken incidentally while hunters are after other upland game. Relatively few individuals report that they go out specifically to hunt cottontails. Management of cottontail rabbits, specifically, is not conducted or planned during the future. However, we anticipate that many of the habitat management actions implemented to benefit bobwhite quail, ring-necked pheasant, and white-tailed deer will coincidentally improve the quality of the installation's habitat for rabbits.

Tree squirrels. No effort has been expended specifically to manage squirrels on Fort Riley, and no such work is planned. However, squirrels benefit from actions implemented to generate revenue from and/or increase the commercial value of the installation's woodlands. No harvest objective is established for tree squirrels.

8.6.2.2. Big Game

Big game harvest objectives are substantially different from those for upland game harvest management since big game species are long-lived, and thus hunting mortality is additive rather than compensatory. Also, big game harvest objectives, particularly for deer and elk, take into consideration human dimensions are used as population management tools. Particularly, harvest objectives are established to produce desired age and sex composition that in turn affects population dynamics. Population control to minimize animal damage complaints related to deer/elk-car collisions and crop depredation is a principal objective. Recreational aspects related to hunting are other factors to consider in establishing harvest objectives. Also, military training and security measures and safety are taken into account as institutional considerations in achieving big game harvest objectives.

Detailed "portfolios" are maintained for long-term tracking of firearms and elk harvest. These portfolios are in addition to the Annual Wildlife Harvest Management Plans and provide the data for adaptive management of these resources. Both the Firearms Deer and Elk portfolios are on file at DES, Conservation Division.

White-tailed Deer

Management of Fort Riley's white-tailed deer population is a cooperative process between the installation and Kansas Department of Wildlife and Parks. KDWP

establishes hunting frameworks that the installation must work within to attain the installation's population management objectives.

Permitting Framework. Kansas Department of Wildlife and Parks is responsible for issuing firearms and archery deer hunting permits based on a system of Deer Management Units. KDWP dramatically restructured its deer hunting permitting framework in 2001. This change necessitated an equally major revision of the Fort Riley firearms deer permitting process.

Prior to 2001, KDWP had issued limited quotas of firearms deer permits for each Kansas Unit. The state eliminated the quota system in 2001 and began issuing an unlimited number of both "Any" and "Antlerless Only" firearms deer permits for each unit. Another major change was the elimination of the Fort Riley Deer Management Unit 8A. Fort Riley became incorporated into two Units 8 and 9. Unit 8 is that portion of Fort Riley west of U.S. Highway 77 and Unit 9 is the remainder of the post.

The state's previous limited quota system was the means for controlling access to Fort Riley and attain population management objectives. The loss of this mechanism necessitated that Fort Riley develop its own system of allocating access and managing harvest. Fort Riley will manage access and harvest by issuance of "Fort Riley Firearms Deer Carcass Tags". Thus, Fort Riley firearms carcass tags are issued for either Unit 8 or 9.

The number of firearms permits typically issued by the state for the previous Fort Riley Unit 8A had ranged from 480 to 550 permits annually prior to 2001. These permits were a combination of "Any", "Antlerless" and "muzzleloader" permits. Fort Riley will issue a comparable number of Fort Riley Firearms Deer Carcass Tags split among the two units. Table 8.2 on the next page shows the types and numbers of these carcass tags to be issued in 2001:

Table 8.2 Numbers and Types of Fort Riley Firearms Deer Carcass Tags

West of U.S. Highway 77 (Unit 8)	Remainder of Fort Riley (Unit 9)
50 Tags Available	430 Tags Available
20 "Either-sex" White-tailed Deer tags	180 "Either-sex" White-tailed Deer tags
25 "Antlerless" White-tailed Deer Tags	215 "Antlerless" White-tailed Deer Tags
5 Muzzleloader Either-sex White-tailed Deer Tags	35 Muzzleloader Either-sex White-tailed Deer Tags

Another element of the Fort Riley firearms deer hunting framework is to ensure that Fort Riley soldiers are provided maximum opportunity to participate in deer hunting. Fort Riley soldiers will be allocated 50% of the Fort Riley Firearms Deer Carcass Tags. All others (general public, Department of Army Civilians, military retirees) will be allocated the other 50%. KDWP has been informed of this system and has not objected.

An unlimited number of Kansas archery deer permits, valid for "Any" deer, and Fort Riley archery deer permits are available, but interest in archery hunting is limited. The

number of archery hunters ranges from 70 to 100 annually. The will be no allocation system among user groups for Fort Riley archery tags.

The dates of the firearms deer season are different from the State's season dates. The fort season comprises 12 days split into 3 segments that coincide with Thanksgiving and Christmas training holidays to maximize available hunting opportunity. The archery season is the same as that of the state of Kansas.

Harvest Objectives. Fort Riley's deer population management strategy employs firearms hunting as the primary management tool. Muzzleloader and archery hunting are not important for managing population dynamics due to the minor harvest associated with these types of hunting. However, both of these types of recreation serve a special clientele, and so, deer management will continue to serve and recognize these types of hunters.

Two fundamental objectives apply for deer management on Fort Riley. The first is population control. Adequate population control is attained by emphasizing the harvest of females. Also, there must be a substantial number of deer removed. The second objective is to produce "quality bucks" (i.e., those having antlers characteristic of a 2 ½ year old or older deer). Limiting harvest pressure on bucks will allow the male segment to reach maturity.

To achieve these objectives and benchmarks, the firearms deer harvest is controlled by limiting the total number of permits issued and manipulating, as necessary, the type(s) (e.g. antlered vs. antlerless) of deer that may be taken. The strategy is to issue more tags for "antlerless only" deer than for "Any" deer.

An annual harvest of at least 180 animals with at least 60 % of those antlerless is considered necessary to achieve population control. A firearms hunter success rate (percent of tags successfully filled) of at least 40% annually is considered desirable.

The second management objective is to have at least 40% of the harvested males be 2 1/2 years and older. The management strategy is to issue a conservative number of "Any" deer tags to limit the harvest pressure on the buck segment. This allows the bucks a chance to reach maturity (and thus produce larger racks) but at the same time, provide hunters with sufficient opportunity to take a buck.

Firearms restrictions, established in 1994, prohibit the use of "high-powered" center-fire rifles during the November segment of the hunt. The purpose of this restriction is to reduce pressure on the bucks because this first segment occurs during rut when bucks are very vulnerable. Also restricting firearms to shotguns and muzzleloaders reduces the number of hunters afield and also reduces the range at which a deer can be taken.

Antler growth can also be used as an indirect reflection of habitat conditions. Numerous small antlers in the harvest may suggest that habitat carrying capacity has been exceeded. Thus, antler morphology may be used as a benchmark of habitat conditions; at least two

animals each year should have antlers that score a minimum of 135 points (Boone & Crockett typical) or 150 points (Boone & Crockett non-typical). No more than two "spike bucks" should be taken each year and the antlers of at least 60 percent of the adult (age 2.5+) males should have eight or more points.

Table 8.3 (below) reflects increased hunter success since 1994. Firearms deer harvest on-post have increased during the last five years. Concurrently, the number of days required to harvest a deer has decreased. The average annual harvest during the last four years has been 198, whereas from 1991 to 1994, the average harvest was 174. The increasing harvest may reflect both an increased deer herd size and increased vulnerability due to an improved road system, which may have resulted in greater access throughout most of the installation.

Table 8.3. Firearms Deer Harvest Summary

Year	**2000**	**1999**	**1998**	**1997**	**1996**	**1995**	**1994**	**1993**	**1992**	**1991**
# Harvested	188	182	208	192	198	197	135	187	174	201
Harvest Rate (mandays per deer)	7.1	8.1	8.0	8.4	8.6	8.1	12.7	9.7	10.8	10.1

Firearm restrictions during the November segment appear to have produced an increase in the proportion of mature bucks in the harvest, which has been 40% or more during the period 1996 - 1999 (Table 8.4 next page). Tooth cementum age data not yet available for the year 2000 deer harvest. Prior to 1994, only one year in four met that objective, and the proportion was substantially less in three of the four years (1990-1993).

Table 8.4 Summary Of Mature Buck Harvest

Year	**1999**	**1998**	**1997**	**1996**	**1995**	**1994**	**1993**	**1992**	**1991**	**1990**
Mature Buck %	52	43	40	47	33	49	40	35	39	26

Hunting pressure on the herd apparently has not been enough to skew the age structure of the herd toward a preponderance of young. In fact, tooth cementum annuli analysis indicates a relatively old age structure of both male and female segments. Also, population data suggest a sufficient harvest is preventing the population from growing out of control. Proportions of antlered and antlerless deer in the harvest have remained relatively stable throughout the 1990s, with antlerless deer comprising 60 to 65% of the annual harvest.

Although, sufficient harvest prevents explosive population growth, the female segment could withstand more pressure. However, this will be difficult to achieve because hunter interest in harvesting does is limited. Approximately 20% of the available “antlerless only” tags have remained unsold during each of the last several years.

Elk.
Management of the elk herd on Fort Riley and surrounding private lands has been a collaborative effort between the installation and Kansas Department of Wildlife and Parks. Each agency has a specific role and individual responsibilities in this cooperative effort. The state is the proponent of the herd and has authority to establish annual harvest quotas and long-term population management objectives. Fort Riley's role is to manage its land (habitat) and to monitor population status. Fort Riley suggests harvest quotas based on population surveys and military criteria, but KDWP is responsible for establishing the harvest framework.

Permitting Framework. KDWP issues a limited quota of elk hunting permits for the unit in which Fort Riley is located. Per Kansas Administrative Regulation, 115-25-8, promulgated and approved by Kansas Department of Wildlife and Parks Commissioners, permittees shall be drawn from a pool of applicants who are Fort Riley soldiers and applicants who are not Fort Riley soldiers. Fort Riley soldiers automatically go to a final pool of applicants who are made up of an equal number of Fort Riley soldiers and general public (all others), if more than 100 soldiers apply. If less than 100 soldiers apply, then that number and 100 general public go into the final pool.

Population Management. Population management has been an adaptive strategy since the initial reintroduction in 1986. The management strategy until 1990 was to allow the herd to grow unrestrained without hunting. The first elk hunting season was established in 1990 when herd size was determined sufficient to support a harvest of surplus bulls. The population management strategy from 1990 to 1996 was to allow the antlerless segment of the herd to grow unrestrained as long as conflicts with adjacent landowners did not occur. Secondly, a conservative harvest of mature bulls was to provide a limited trophy-hunting opportunity. A ratio of not less than one antlered per ten antlerless animals in the population was maintained, and the total number of antlered animals was to be no fewer than three.

Further population growth promoted a shift from conservative quotas to liberal quotas that emphasize population control. A liberalized harvest strategy emphasizing population control to prevent crop depredation and conflicts with adjacent landowners was established in 1996. The state began issuing "antlerless only" tags to stabilize population growth that year. "Bull only" tags were converted to "any elk" tags in 1997.

A very substantial increase in the number of tags issued occurred in 1999. Antlerless tags increased from 10 in 1998 to 75 in 1999. The number of antlerless tags was slightly decreased in 2000 to 65. Discussions with KDWP and others suggest that to maintain herd sizes at desirable levels, the number of antlerless tags issued should be about 1/3 of the herd size. Nevertheless, maintaining surplus bulls in the population to ensure a trophy segment remains a population objective of KDWP.

The framework (e.g., season lengths and number of segments) has been adapted as well to accommodate changing population management objectives. For example, season

lengths, number of segments, numbers and kinds of tags, and type of legal weapons have been modified to accomplish increasing harvest quotas. One foremost constraint for reaching harvest objectives is access restrictions due to military training. Therefore, long seasons are needed to provide sufficient opportunity to reach harvest goals.

Prior to 1999, the Fort Riley elk hunting season was typically divided into two segments. The first occurred in September with muzzleloaders and archery equipment as legal methods of take. The second segment began in late October and lasted two months. Archery equipment, muzzleloaders, and high-powered rifles were legal equipment during this phase.

The framework of the season was radically changed in 1999 to accommodate the greatly increased number of hunters needed to achieve sufficient harvest. The season was lengthened and divided into three segments. A limited number of hunters was allowed to hunt during each segment to evenly and safely distribute hunters. Also, the 1999 season was the first season that off-post hunting was allowed, and it included several surrounding counties. Furthermore, Hunt-Own-Land Permits were issued by the state to private landowners in addition to the regular permits issued. This basic framework was maintained in 2000.

Elk hunters on Fort Riley have high success rates: the overall success rate (1990-1999) has been 73%; the success rate for bulls (including bull only and any tags) has been 88%; success rate for "antlerless only" tags is 60%. Data from the 2000 season show much lower success rate for antlerless elk but hunter surveys indicate that eight people did not hunt. The higher success rate for filling bull tags is attributed to hunters expending more effort for the bull trophy value than for the less valued cows or calves. Table 8.5 shows the number of tags issued and the number filled since 1990.

Table 8.5. Number and Kinds of Tags Issued And Harvest, 1990-2000.

Year	**"Any" Elk**		**Antlered**		**Antlerless**	
	# Tags Issued	# Harvested	# Tags Issued	# Harvested	# Tags Issued	# Harvested
1990			4	3		
1991			4	4		
1992			4	4		
1993			2	2		
1994			1	1		
1995			3	2		
1996			4	3	4	4
1997	3	3			7	4
1998	5	4			10	5
1999*	10	7			75	41
2000	5	5			65	22

* reported on-post harvest only, does not include off-post harvest or "Hunt Own Land"

Older age classes, as determined by tooth cementum annuli analysis, dominate the harvest. These older age classes reflect a population that is not heavily exploited. Meaning harvest pressure is not heavy enough to skew the age structure toward younger age classes. Secondly, bull hunters tend to select older, trophy-sized bulls.

It is anticipated that the current population objectives for the elk herd will be maintained and that Fort Riley will continue to recommend to the KDWP an annual hunting framework similar to the current liberalized framework to keep the elk herd's size in check while maintaining a significant number of mature bulls in the herd.

Fort Riley has expended substantial funds to manage the elk herd. Table 8.6 below shows that the Army has expended approximately $123,460 in direct funds from 1986 to 2000. The greatest expenditures have been for food plot planting, and aerial surveys are the second greatest expenditures. Substantial expenditure to manage the elk herd by food plot planting and aerial survey is planned to continue through 2004.

Aerial survey expenditures are for rental of commercially available aircraft only and do not include flight costs of UH-1 rotary-wing military aircraft. The costs listed below do not include salary, labor, and equipment use costs.

Table 8.6 Summary of Expenditures for Elk on Fort Riley

ACTIVITY	Food Plots	Aerial Surveys	Telemetry equipment	Stocking	Other
COST	$102,595.00	$11,200.00	$5,000.00	$3,900.00	$700.00

Wild Turkey. The installation's management goal for wild turkeys is to maintain robust flocks in every major creek and river drainage. Harvest of bearded turkeys is allowed using firearms and archery equipment during the spring. The fall season is an either sex season for archery or firearms.

Again, Fort Riley harvest objectives have shifted from conservative to liberal approach as flocks became more numerous. Initially, only a springtime "tom" season was allowed during which potential harvest was limited to no more than approximately 20% of the estimated spring male population. Thus, hunters could possess only one tag per season. In recent years, firearms hunting was allowed in the fall, and hunters could possess two tags for both the spring and fall season. Based on literature reviews, fall harvest benchmark is to allow 30% of the fall population to be harvested.

Spring harvest will reach a limit at some point simply because the number of hunters allowed in the field is limited. Since Fort Riley's first season, the number of spring hunters has been limited to 50 – 60 hunters. Yet, because of the nature of spring turkey hunting and because military training at that time often precludes access to much of the post, too many hunters in too few open areas would greatly compromise safety. Therefore, numbers of hunters are severely limited to provide a safe and high-quality hunt.

Access for spring turkey hunting is allocated by a random drawing that takes place in March prior to the opening of the spring season. Typically, 150-200 hunters apply for the limited number of Fort Riley permits.

Waterfowl. Fort Riley's hunters have reported taking as many as 152 ducks in a year (1973). However, typical harvest since 1993 has been much lower (about 40 each year), while geese are seldom taken on Fort Riley. A feasible management objective is to increase the number of waterfowl that stop over on Fort Riley while migrating. However, attainment of that goal may not result in increased waterfowl hunting or harvest since most of the installation's waterfowl habitat is in areas that are off-limits when the Douthit Range Complex is active. Wetland management designed to increase waterfowl use of available habitats is described in Section 8.5.3, *Wetlands Habitat Management* and Section 8.10, *Wetlands Management***.**

8.6.3. Furbearer Harvest

Furbearer populations are not closely managed on Fort Riley. Trapping is prohibited and furbearer hunting is relatively unpopular. Typically fewer than ten coyotes and raccoons are reported harvested per year. Some monitoring projects have been implemented. Two research projects conducted by Kansas Sate University included, monitoring as part of the projects.

Furbearer populations are underutilized as a recreational resource on Fort Riley because trapping is not allowed and few persons are interested in furbearer hunting. Typically fewer than ten coyotes and raccoons are reported harvested per year. Little effort is, therefore, expended directly to manage their populations except to control nuisance individuals. Raccoons and striped skunks, for example, commonly pose a nuisance by digging up turf areas in search of grubs. These, nuisance individuals are routinely trapped and euthanized.

It is not anticipate that trapping will be allowed on the installation during the period covered by this plan because of its potential conflicts with other recreational activities such as bird hunting with dogs and because we can not possibly guarantee that major portions of the installation will be accessible to trappers on consecutive days to check traps as is legally and humanely required.

No harvest objectives are established for furbearers due to the low participation in sport hunting of those animals legal in Kansas. Conversely, hunting for beavers, one of the installation’s principal furbearing species, is not legal in the state.

8.6.4. Sport Fish Harvest Management

Presently, 29 ponds and lakes are actively managed for sport fishing, and game fish management on Fort Riley (Exhibit 8.2, on next page).

Other game fish species are introduced or supplemented through periodic stocking at Fort Riley in accordance with management plans developed for individual ponds and lakes by the DES, Conservation Division. These supplemental stockings consist of largemouth

bass, wipers, flathead catfish, redear sunfish, and hybrid bluegill. In addition, northern pike and/or tiger muskie were stocked at Funston Lake, Marshall Lake, and Moon Lake during the 1980's. Also, a put-and-take rainbow trout fishery at Cameron Springs has been developed. Other unstocked game fish species reported to inhabit some ponds and streams include white bass, yellow bullhead, black bullhead, green sunfish, white crappie, and spotted bass.

Specific management plans for Fort Riley ponds and lakes with high potential for fishery were developed in 1982 (Abel, 1982) and then revised in the updated Sports Fishery Management Plan in 1988. Those plans were limited to the periodic stocking of harvestable-sized trout and channel catfish into Cameron Springs and the stocking of harvestable-sized channel catfish into 22 other ponds. The development of Annual Pond Management Plans was initiated in 1999 to provide a more diversified sport fishery program with more emphasis on sustainable populations.

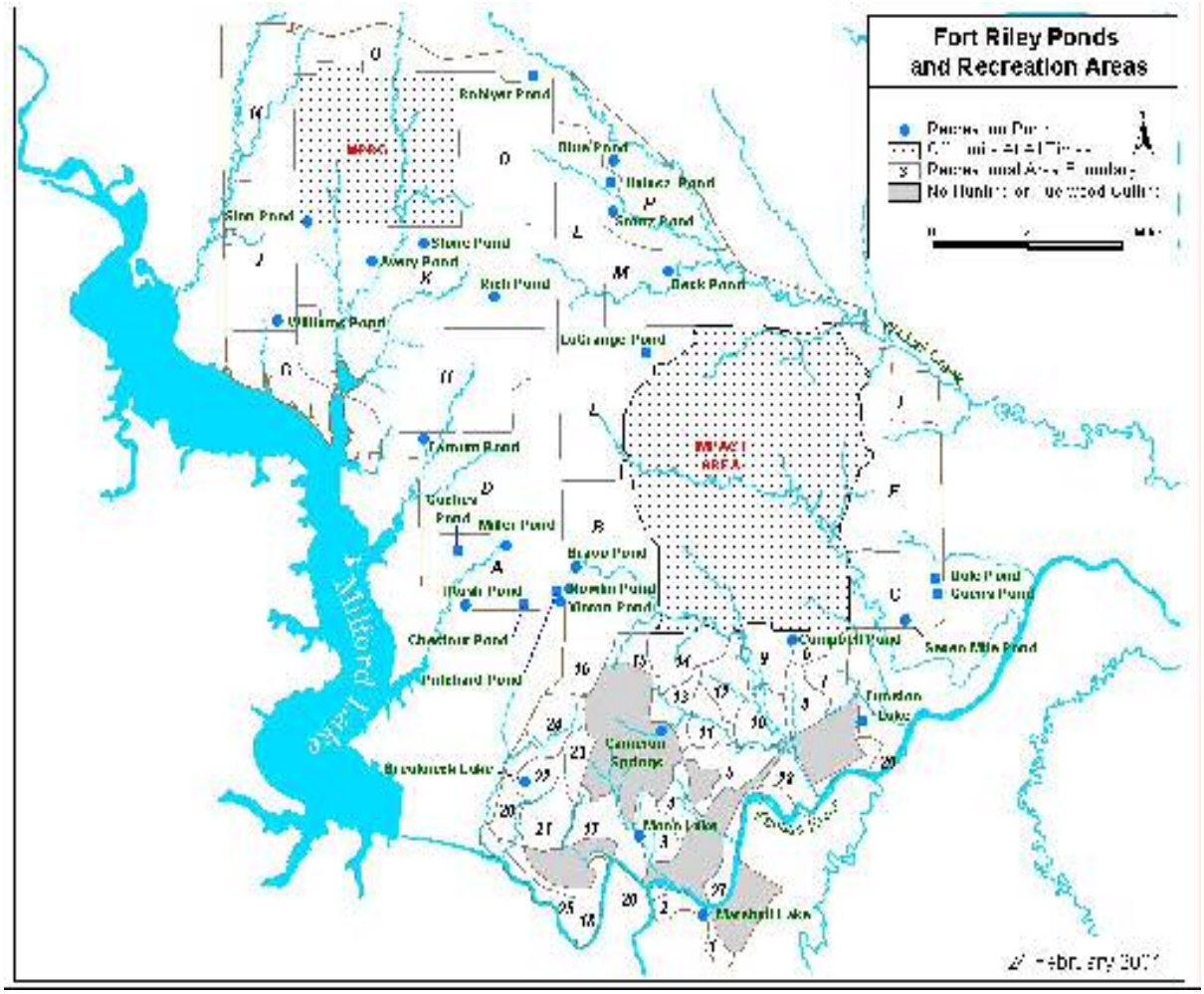

Exhibit 8.2

The installation plans to continue the active management of the 29 ponds and lakes, and to increase their value as a warmwater fishery. Thus five generic management objectives apply to managed ponds and lakes:

- increase production of total game fish biomass.
- increase fish survival of selected species.
- increase fish growth rates.
- optimize reproduction of selected species of game fish.
- effectively use the dynamic relationships among the first four objectives.

Some of the 14 streams located on Fort Riley, such as Madison, Rush, Seven Mile, Wind, and Timber creeks, have limited potential for fishing since pools present in their lower reaches support small populations of sport fish. The USFWS (1992) noted from surveys of the Topeka shiner that many of the streams have good water quality and habitat features that maintain a diversity of aquatic life. However, the number of catchable fish that these streams can support will never be large; therefore, no sport-fish management effort has been directed toward them.

The overall objective for sport fishing on Fort Riley is to sustain a biomass of fish in harvestable-sizes to support 20,000 fishing trips annually on post. Sustained yield is only applicable to sport fisheries in those managed ponds and lakes with self-sustaining populations.

8.6.4.1. Sport Fish

Catfish. Eighteen of 29 ponds and lakes are managed primarily for catfishing. Most of these are similar to an "urban fishery". Many of the ponds are located near cantonment areas or within close proximity to communities off the installation. The primary harvest objective for these ponds is to provide sufficient fish to support fishing throughout the fishing season (March – October). However, there is no expectation that populations carry over from year to year.

Annual stockings of 8,000 to 13,000 pounds of harvestable-sized channel catfish are undertaken to support this put-and-take strategy. The most recently completed creel census (1998) suggested that stocking rates are efficient and the fish are being utilized at acceptable levels, based on a return rate of 30% or more of stocked fish (Mosher, 1999). Harvest as determined by the 1989 census is estimated to be nearly 100% at Moon Lake, approximately 60% at Breakneck Lake, and approximately 35% at Funston Lake. DES, Conservation Division biologists believe that this high rate of return is typical in most, if not all, catfish ponds. Stocking rates could be increased substantially, but limited funding precludes this management option.

Stocking rates will be reduced if any of the following criteria are met (Mosher, 1999):

- Mean Weight Ratio (MR) of most recent stocking class is less than 80;
- Fishing mortality as determined by creel census is less than 30%;
- Mean length after 1 year is less than 12 inches.

Fingerling channel catfish are occasionally provided by the KDWP as part of the installation's Cooperative Agreement with that agency. However, fish availability from the KDWP is unpredictable due to that agencies priorities to stock state lakes. These fingerlings are stocked into the lakes and ponds where fishing pressure is the heaviest as a means of augmenting catfish populations.

Mature flathead catfish (40 fish totaling 330 pounds) were stocked into Funston and Moon lakes (two of the largest lakes) during FY96. The purpose was to control over-abundant, stunted populations of shad (in Moon Lake) and white crappie (in Funston). These flathead catfish were obtained as salvage fish from Kansas Department of Wildlife and Parks when Tuttle Creek Reservoir stilling basin was drained. Such fish also are anticipated to be stocked in the future as they become available.

Bass. Nine lakes and ponds are managed for a largemouth bass fishery. Fingerling largemouth bass are stocked as necessary to augment existing populations. These fingerlings are obtained commercially or from the KDWP. In addition, two wiper populations were established within the last three years in Funston and Moon lakes by stocking of fingerlings.

Kentucky (spotted) bass are present in Wildcat Creek. This population is under-utilized and thus, no effort has been made to increase its size through management.

Rainbow Trout. Cameron Springs is a put-and-take rainbow trout fishery present in a 1.7 acre, spring-fed pond. Trout are stocked when water temperature is less than 60^{o}, and catfish are stocked when water temperature is higher. The trout, which average about 0.5 pounds each and 10-11 inches long, are obtained either from commercial sources or from the USFWS National Fish Hatchery in Neosho, Missouri. Until 1999, 500 pounds of rainbow trout were stocked monthly from October through May for a total of 4,000 pounds annually. Stocking rates were reduced in 1999 as a result of estimates of declining fishing pressure.

Estimates indicate that fishing pressure (as reflected in total number of angling hours) has declined from the 1980's to the present. This decrease is attributed to the downsizing of both military and civilian personnel levels on post. Therefore, stocking rates were reduced in 1999 from 8,000 to 4,000 fish because fewer anglers utilize the resource and fewer trout permits are being sold. Also, user fees were not keeping pace with the cost of trout. Thus, the Fish and Wildlife Account was subsidizing this trout fishing that serves a relatively small clientele.

Additionally, the current stocking rate is consistent with management guidelines established by the KDWP. The previous stocking rates (prior to 1999) at Cameron Springs is much higher than the recommended rates of 100-500/fish/acre/month. The new management strategy will be monitored periodically through creel surveys to determine whether it meets anglers' desires and a harvest target of 1.5 trout per hour of fishing effort. If not, the stocking rate will be adjusted to meet that target.

Other fisheries. Several ponds are managed for either hybrid bluegill or for mixed fisheries consisting of combinations of bluegill, redear sunfish, catfish, wipers, and largemouth bass. These ponds provide a diverse fishing opportunity and are managed specifically as multi-species lakes.

8.6.4.2. Fish Population Control

Selected species of fish have been controlled through piscides such as rotenone, through mechanical removal using gill nets and electroshocking, with supplemental stockings of predatory fish, or simply by draining a pond to reestablish a desired population.

Fish toxicants such as rotenone have been used to kill off existing populations of stunted bluegill and unwanted catfish to establish new populations of more desired fisheries in two ponds in 1996. One of these established was a hybrid bluegill fishery (Avery) and the other a mixed fishery of largemouth bass and bluegill (Stone). Electroshocking, gill netting, and removal of large rough fish such as carp and long-nosed gar was conducted in 1997 in the largest lake on post (Funston Lake). Also ponds with unwanted populations of green sunfish have been drained and renovated periodically.

Biological controls use natural predator-prey relationships to control population balances. For instance, corrective stockings of large (1 to 5 pounds class) flathead catfish were conducted in two of the larger lakes on post to control overcrowded shad and excess crappie, and corrective stockings of bass were made in FY96 (Vinton) and FY98 (Pritchard). It is anticipate that similar reductions of targeted components of fish populations will continue throughout the period covered by this plan.

8.6.4.3. Fish Attractors

Fish attractors on Fort Riley provide additional habitat structure and food. Such structures include tire reefs, brush piles of discarded Christmas trees and cedars removed during prairie restoration, and pallets. Also, fish feeders provide a direct source of food; three fish feeders currently disperse approximately 300 pounds of feed monthly at Funston, Breakneck, and Moon lakes. A total of 1,500 pounds of feed is used during the season of May through September. These attractors directly benefit anglers by making fish available as well as improving the quality of the fish caught. Thus, their use is expected to continue throughout the period covered by this plan.

8.7. Threatened, or Endangered Species Management

Threatened and endangered species management on Fort Riley both complies with relevant state and Federal regulations and ensures biodiversity conservation. The

protection of these species and their habitats enhances genetic diversity, species richness, and ecosystem diversity. According to the Army's Environmental Manager's Handbook, *Threatened and Endangered Species Management* (July 1994), management of Federally- and state-listed species on Army installations includes the following tasks:

- Identify the Federally- and state-listed threatened and endangered species that exist on Fort Riley or in the nearby area.
- Assess the effects of proposed actions on those species.
- Establish installation procedures to protect the species and their habitats.
- Monitor the effectiveness of the procedures.

8.7.1. Compliance Process

Protection and management of threatened and endangered species is conducted in accordance with the Endangered Species Act (ESA), the Kansas Nongame and Endangered Species Conservation Act, the National Environmental Policy Act (NEPA), Army Regulations 200-3, Department of Defense (DoD) Directive 4715.3, FORSCOM Technical Note 420-74-1, FORSCOM Technical note 420-74-2, USFWS regulations and agreements, and other applicable laws or guidance from higher headquarters.

Actions potentially affecting Federally-listed species (or proposed species) must be reviewed by the USFWS while actions affecting state-listed species must be reviewed by the KDWP. The status of habitats and population trends of Federally-listed threatened and endangered species are and will continue to be monitored to ensure compliance with sections 2, 7, and 9 of the ESA. Species listed by the state of Kansas that are found on Fort Riley also are and will continue to be monitored. In addition, rare species are monitored according to developed surveillance plans incorporated into Annual Wildlife Monitoring Plans (on file at DES, Conservation Division).

Scientific collection permits from both the USFWS and the KDWP are required to possess any state or federally-listed threatened and endangered species. Fort Riley conducts surveys under USFWS Permit No. SP98-13.00 (under authority of permit PRT-704930) for capture and collection of Topeka shiners and the American Burying Beetle. The KDWP permit is the State of Kansas Scientific, Education or Exhibition Wildlife Permit (permit no. SC-133-2001) which allows the collection of all native Kansas species, including any sick, injured or otherwise incapacitated migratory bird species, or body parts and carcasses thereof.

8.7.1.1. Consulting Activities

Fort Riley is typically involved in five to six informal consultations per year with the U.S. Fish & Wildlife Service. All of which have involved one of two species, either the Topeka shiner or the bald eagle. Informal consultations concerning the Topeka shiner have typically involved mission-related activities that had the potential to degrade in-stream water quality. Informal consultations concerning the bald eagle have involved

activities ancillary to the military mission (e.g., developing a horse pasture or clearing trees beneath a power line) that require the removal of trees within the state-designated critical habitat of the bald eagle.

Installation Restoration Program activities along the Kansas and Republican rivers within state-designated bald eagle habitat have required several instances of informal consultation since 1993. Many of the activities were similar in nature and scope and produced similar effects. Most activities such as drilling and placement of water sampling wells and the sampling of those wells required the removal of trees to provide access. Thus, DES, Conservation Division in 2001, developed a Programmatic Agreement. This PA has recently been submitted to the KDWP and USFWS for review and comment.

Fort Riley has not participated in any formal consultations with the U.S. Fish and Wildlife Service. Neither Biological Opinions nor Jeopardy Opinions have been issued by either agency. Fort Riley has never been found liable for any "take" instances.

An upcoming Biological Assessment is being drafted by the installation covering Road Maintenance. DES, Conservation Division concluded that road maintenance could potentially affect the Topeka shiner and state-designated critical habitat. Thus, a Biological Assessment requiring formal consultation is being prepared.

8.7.2. Endangered Species Management Plan

The installation developed an Endangered Species Management Plan (ESMP) in 1997 to facilitate compliance with the Federal Endangered Species Act and the Kansas Nongame and Endangered Species Conservation Act while maintaining accomplishment of the military mission. That plan addresses measures that are taken to protect each Federally-listed species and each species Federally-proposed for listing. The ESMP is being revised in 2001 due to changes in species listing status and changes in state-designated critical habitat. It will be reviewed and signed by the KDWP and the USFWS.

The format and basic content of the plan is prescribed by Army guidance. An installation team comprising of natural resources managers and the G3/DPTM Training Division and the Staff Judge Advocate (SJA) personnel developed the ESMP, which was then reviewed and approved by both the USFWS and the KDWP. The ESMP is incorporated as Appendix E into this plan. A report on the status of accomplishment of the actions prescribed by it is provided to FORSCOM by 31 December of each year. The ESMP will be revised as required during the period covered by this plan to reflect changes in listed species, listed species and critical habitat known to be present on Fort Riley, and military and other installation missions.

8.7.3. Integration with the Military Mission

Fort Riley Endangered Species Management Program is consistent with Army Guidance provided in AR 200-3, Chapter 11 (*Endangered/Threatened Species Guidance*) that commits the Army carrying out mission requirements in harmony with the ESA. Army Guidance states that the key to successfully balancing mission requirements and the

conservation of listed species is long-term planning and effective management to prevent conflicts.

Fort Riley's ESMP is the critical mechanism for this balance. The ESMP was a collaborative effort with G3/DPTM staff. A specific example of successful planning based on Fort Riley's ESMP was the fielding of the M-56/58 Smoke Generator. Close collaboration with the 937th Engineers allowed Fort Riley to be the first Army installation to field the M-56/58. A Commanding General Policy Number 14-5 directed that the Smoke Generator be used only in areas where Topeka shiner are not present nor near potential shiner streams. The Policy also directs that graphite use be monitored.

8.8. Other Nongame Management

The primary means available to protect these species is management of their habitat. Biologically appropriate ecosystem management should ensure the continued existence and biodiversity of nongame fish and wildlife on Fort Riley. The taking of nongame wildlife, except as prescribed by Kansas Department of Wildlife and Parks, is prohibited unless appropriate permits are obtained. The taking of nongame birds is also prohibited by the USFWS per the Migratory Bird Treaty Act unless a Federal permit is obtained.

8.8.1. Neotropical and Other Nongame Migrant Birds

The avifauna of Fort Riley is rich and diverse, with 223 bird species documented on the installation. Most of these species are migrant, non-game passerines. The birds occupy a wide range of habitats on the installation, from riverine sandbars to interior woodlands.

Grassland birds have experienced the most severe decline in population of any type of land bird in North America. Fort Riley's predominant habitat is grassland, and that grassland provides habitat for some grassland species in decline throughout their range. The fort also contains substantial woodland habitat. That woodland has been found to attract Neotropical Migratory Bird Species (NTMBs) that are characteristic of interior woodland tracts, another group of birds experiencing population declines. Historically, little effort has been directed toward specific management of nongame birds that are not protected by Federal or Kansas endangered species laws. However, the DoD and the Army places special emphasis on protecting NTMBs through participation in the Partners In Flight program and strongly advocates their management. Fort Riley plans to develop and begin implementing a specific management plan for NTMBs during the period covered by this plan. The NTMB Management Plan, which will complement and supplement this plan is expected to be completed by the end of 2002.

The take or possession of migratory birds by DES, Conservation Division and U.S. Department of Agriculture-Wildlife Services (USDA-WS) is conducted under Federal and state permits. The USDA-WS possesses a Federal "Special Purpose" permit that allows the take of migratory birds (except bald and golden eagles and threatened and endangered species). The permit also authorizes retrieval and possession of injured migratory birds "including eagles". The USDA-WS also possesses a State of Kansas Scientific, Education or Exhibition Wildlife Permit that allows the collection of all native Kansas species, including any sick, injured or otherwise incapacitated migratory bird

species, or body parts and carcasses thereof. DES, Conservation possesses a State of Kansas Scientific, Education or Exhibition Wildlife Permit as well.

8.8.2. Reptiles And Amphibians

Management efforts directed specifically to reptiles and amphibians consist of population monitoring and enforcement of state laws prohibiting over-exploitation by collectors. No habitat management efforts have been directed, specifically, at this group of wildlife.

Sufficient habitat is present on Fort Riley to support a variety of snakes, turtles, lizards, frogs, and toads commonly in the tallgrass prairie region (Busby et al, 1994). The numerous shallow and ephemeral ponds on Fort Riley provide habitat for salamanders, frogs, and some snakes and turtles. Ponds and lakes that have little shoreline and shallow water vegetation generally provide poor habitat for frogs and salamanders because they lack sufficient cover for aquatic forms of these organisms to use to escape predation by fish.

8.9. Nuisance Wild Animal Control

Wildlife and feral animals can on occasion cause conflicts with Fort Riley inhabitants and the Fort Riley training mission. Control of nuisance wild animals includes the application of techniques and methods to suppress or bring under control damage caused by wild animals deemed injurious to agriculture, natural resources, property, or human health and safety, as well as manage wild animals that are reservoirs of zoonotic diseases. Wild animals include wildlife (as defined by the state of Kansas) and feral animals (swine, dogs and cats).

DES, Conservation Division began developing annual Nuisance Wild Animal Control Plans in the year 2000. The annual plans combine the species-specific plans developed by U.S. Department of Agriculture-Animal and Plant Health Inspection Service-Wildlife Services (USDA-WS) with procedures developed by DES, Conservation Division to handle complaints. These annual plans are on file at the DES, Conservation Division, Fish and Wildlife Section Office.

The take of nuisance wildlife by USDA-WS for the purpose of animal damage control is conducted under one Federal permit and two state permits. The Federal permit is a "Special Purpose" permit described above in Section 8.8.1. The USDA-WS also possesses a State of Kansas Scientific, Education or Exhibition Wildlife Permit also described in Section 8.8.1. In addition, a state-issued "Nuisance Animal Damage Control Permit" is retained by USDA WS for the control of furbearers, coyotes, and pigeons, starlings and house sparrows, small game, nongame animals, reptiles and amphibians, and invertebrates.

8.9.1. Wildlife Control

The Military Police-Animal Control Section managed nuisance wildlife until this duty was eliminated in 1995. Fort Riley currently primarily relies on private pest controllers to remove nuisance wildlife inside buildings in the cantonment areas. Outside of cantonment areas, Fort Riley contracts with the USDA-WS to control wildlife causing

damage and to deal with conflicts between wild animals and humans. Staff from the Fish and Wildlife Section, DES, Conservation Division, augments these personnel and are available when contract personnel of USDA-WS personnel are unable to respond quickly. Control plans for specific animal species written by the USDA-WS are on file at DES, Conservation Division.

USDA-WS initially was contracted to control feral swine populations, but its role expanded after wild animal control duties were eliminated from the Provost Marshal Office. USDA-WS does not control domestic animals. The 1990 Memorandum of Understanding between the Department of Defense and USDA-WS is the basis for obtaining technical and operational support.

Nuisance complaints are most commonly received about nuisance birds in hangars, rodents, skunks, raccoons, beaver, and badgers and other burrowing mammals. The bird species that are controlled are pigeons, house sparrows and starlings. One of the most common complaints pertain to raccoons and opossums digging into and feeding from unsecured garbage cans or giving birth to young in CONEX's and other storage buildings on post. Other common complaints include snakes in the housing areas and bats in buildings. Also, occasionally complaints from housing tenants occur when bobcats make forays into housing areas during the spring when hunting to feed offspring.

An emerging issue at Fort Riley is the presence of urban coyotes and foxes. Human health and safety are the primary concerns. Conflict between humans and coyotes/foxes can lead to the spread of diseases, including rabies, and injuries from bites and scratches. Behavior patterns of the coyotes and foxes show increasing boldness and loss of fear of humans. Instances of coyotes being present on school playgrounds and walking down sidewalks during diurnal hours were documented. Also, a small dog was killed and eaten inside a resident's yard. Concerns were such that an Urban Coyote and Fox Management Plan was prepared by USDA-WS in spring 2001. The components of the integrated plan included educational outreach to Fort Riley residents, population control through removal and habitat modification. WS began routine, systematic control of coyotes and foxes in 2001 rather than reacting to complaints. The plan is on file at DES, Conservation Division and will be updated annually.

Bird strikes to aircraft are not a safety issue at Fort Riley because few rotary-wing aircraft are stationed at Fort Riley. Fixed-wing aircraft do not use the airfield. Thus, there is no aviation safety control plan to prevent bird strikes.

Wildlife causing conflict with humans is selectively removed. Commonly, live traps are used to take wildlife present in areas used by humans. Non-lethal removal is encouraged when biologically appropriate or when safety issues are not present. Relocation (also termed translocation) of trapped animals is not considered biologically appropriate for most mammalian species. Fort Riley's relocation policy is consistent with those guidelines established by USDA-WS.

8.9.2. Exotic and Feral Animal Control

Two types of feral and exotic animal control are conducted on Fort Riley. These are control of feral cats and dogs and control of exotic animal species. Feral cats and dogs are not considered major problems in the range area. Control of exotic animal species in the range area is limited to feral swine. There are no other known exotic animal species now present on Fort Riley that require control.

Feral cats and dogs are captured most commonly ancillary to live-trapping wildlife in cantonment areas. These animals are not considered adoptable as pets and often carry diseases. Consequently, feral cats and dogs are either taken to the post veterinarian for euthanasia or euthanized on site at the discretion of the USDA-WS.

Feral swine have been vigorously controlled on Fort Riley since their discovery in 1993. This non-native species can serve as a reservoir of diseases that infect livestock and humans. Kansas passed a law in 1995 making it illegal to possess or harbor feral swine because of the potential for extreme damage to the livestock industry from diseases carried by feral swine. Additionally, feral swine extensively damage native wildlife populations and their habitats, agricultural fields, and forestry plantings. There is particular concern for riparian habitats and streams providing habitat for the Topeka shiner.

Extensive and ongoing coordination and collaboration with other Federal and state agencies have included the Kansas Department of Animal Health, Kansas Livestock Commission, Kansas Department of Wildlife and Parks, Kansas State University-Cooperative Fish and Wildlife Research Unit, and U.S. Fish and Wildlife Service. For instance, FORSCOM was contacted about the removal program and indicated that the program was consistent with Army Policy and Regulations. All contacts support an aggressive feral swine removal program.

Although DES, Conservation Division staff controlled swine prior to 1995, the USDA-WS has implemented an integrated removal program that has resulted in the removal of 400 swine since then. The methods used include cage traps, snares, night shooting over bait, and aerial control. Sport hunting is allowed as a control tool but is not promoted as a viable hunting alternative. Sport hunting is very ineffectual and has resulted in taking less than 10% of the total swine removed from the installation. Most of these were taken incidentally to other hunting. Based on aerial and ground surveys, feral swine populations appear to have been substantially reduced by the control program.

8.9.3. Wildlife Disease Control

Wildlife diseases can negatively affect domestic livestock and human health, and cause extensive wildlife die-offs. Consequently, Fort Riley takes steps to control and monitor certain wildlife diseases. Control practices include testing and vaccinating stocked animals and the captive bison herd. Routine serological testing of harvested deer and swine is conducted. Monitoring of wildlife diseases is discussed further in Section 9.4.3, *Wildlife Disease Monitoring.*

AR 200-3 directs natural resources managers to consult with the post veterinarian about instances of wildlife disease. Additionally, installation personnel consult with and advise local, state, and Federal officials whenever necessary. DES, Conservation Division staff have, at various times, consulted with KSU-College of Veterinary Medicine, U.S. Department of Agriculture-Veterinary Services and Wildlife Services, Kansas Department of Wildlife and Parks, Kansas Department of Animal Health, and Kansas Livestock Association.

Several diseases are of concern or of potential concern at Fort Riley. Brucellosis and pseudorabies are two diseases that could potentially change the Kansas livestock industry. Neither of these two diseases has been found during routine serological screening of harvested deer or swine. Elk brought onto the post for release have been tested and certified free of brucellosis and tuberculosis.

Harvested deer also are routinely screened for Epizootic Hemorrhagic Disease (EHD) and bluetongue (BT). These two hemorrhagic diseases are endemic to the population. Serological testing conducted on blood samples in 1999 showed that 17% and 10% of the samples tested positive for EHD and BT, respectively. At times, deer blood also has been screened for leptospirosis. Typically, five strains are tested. Leptospirosis was detected in 20% of the 1999 deer samples. Most of these positive titers were low and positive for the *Grippotyphosa* strain.

Testing of sick or dead canidae and mustelidae is conducted when disease is suspected. Of particular concern is rabies. An outbreak of canine distemper was detected in the year 2000, affecting both raccoons and coyotes. Although, canine distemper has no human health implications, it can infect unvaccinated domestic dogs and ferrets. Also, its neurological symptoms are similar to rabies; therefore, monitoring was continued as a policy to screen for a potential rabies outbreak.

Fort Riley maintains a policy against translocation to range areas of nuisance wildlife captured in cantonment areas that appear to be diseased or heavily infested with ectoparasites. Wildlife captured as nuisance animals in cantonment areas are examined for signs of disease or infestation. If disease is apparent, the animals are euthanized humanely.

8.10. Translocations and Stocking

Aside from the ring-necked pheasant, which expanded its range to include the installation, no terrestrial game species have been introduced. Three game species have been reintroduced to the installation after having been extirpated shortly after the area's settlement. These species are the wapiti (elk), wild turkey, and ruffed grouse.

Elk were reintroduced to Fort Riley in 1986 as a collaborative effort between the installation and the KDWP. Other Federal agencies, the Kansas State University-Cooperative Fish and Wildlife Research Unit, and private, non-profit conservation organizations have supported various aspects associated with the reintroduction.

Initially, twelve elk were reintroduced to Fort Riley in 1986 with five supplemental stockings since then. The total number of elk released on Fort Riley to date is 50. Most came from a captive herd maintained by the KDWP near McPherson, Kansas although a few were trapped from free-ranging herds in Colorado and Montana. The latest stocking was in 1994 when 18 elk were brought from Wind Cave National Park, South Dakota. The purpose of this stocking was not to increase absolute numbers but to increase the genetic diversity of the herd. All elk stocked were certified to be free of disease.

Fort Riley, in cooperation with the KDWP, began reintroducing wild turkeys to the installation in 1984. Six (two male, four female) eastern wild turkeys were released along Wildcat Creek in January 1984 with an additional stocking of one male and three female eastern subspecies birds was made near the original release site in January 1985. At about the same time, the KDWP released both eastern wild turkeys and Rio Grande wild turkeys (*M.g. intermedia*) in the Timber Creek Drainage on its Milford Lake Public Hunting Area, which lies adjacent to Fort Riley's western boundary. From those and other stockings in the Kansas River drainage, turkeys have spread throughout Fort Riley.

Forty-nine ruffed grouse were released at Fort Riley in the fall of 1991. This reintroduction does not appear to have been successful. Spring drumming surveys have not shown any grouse to be present on post nor have any observations been made of any grouse in the past few years. Most ruffed grouse reintroductions to Kansas either have not been successful or have been only marginally successful.

Several fish species have been introduced at Fort Riley to control weeds in ponds, control overabundant forage-fish, and/or fill an underutilized niche. Stocked fish include the rainbow trout, esocids, white amur, and wiper. White amur are stocked to control excessive aquatic plant growth and are successful in controlling aquatic plant growth in several waterbodies.

8.11. Wetlands Management

The Kansas Biological Survey concluded that high-quality wetlands were limited in distribution on Fort Riley (Lauver 1994). The report recommended "the natural wetlands on post deserve special concern because of their rarity across the Great Plains." (page 31). It was further recommended that alterations of natural hydrology be limited, and proactive steps be taken to protect natural functions. Attempts to recover damaged wetlands uses only native species that represent the potential natural vegetation of the site.

Wetland management on the installation is conducted for two primary purposes: first, to comply with various laws and regulations and, second, to manage wildlife habitat. Fort Riley complies with Executive Order 11990, *Protection of Wetlands,* which requires a "No Net Loss" of wetlands on Federal lands. DoD Instruction 4715.3, *Environmental Conservation Program*, directs that operations and activities on DoD lands shall avoid the net loss of size, function, and value of wetlands. Army Regulation 200-3, *Natural Resources-Land, Forest and Wildlife Management*, is consistent with EO 11990 and DODI 4715.3 and furthermore, explicitly states that the Army, "will take a progressive

approach towards protecting existing wetlands, rehabilitating degraded wetlands, restoring former wetlands, and creating wetlands." (Chapter 2, paragraph 21).

The second purpose is to create new wetlands and restore and enhance degraded wetlands for wildlife habitat. The North American Wetlands Conservation Act (NAWCA) of 1989 (16 U.S.C. 4401-4414) provides the legal basis for wildlife-related management of wetlands on Fort Riley. The NWCA cites the North American Waterfowl Management Plan (NAWMP), signed in 1986, to which the Department of Defense is a signatory. The NAWCA references the NAWMP to provide a "framework for maintaining and restoring an adequate habitat base to ensure perpetuation of populations of North American waterfowl and other migratory bird species" {(Part 4401 (a)(12)}.

8.11.1. Wetlands Creation and Restoration

Wetlands creation includes new construction of both shallow and deep-water (more than 3 feet) impoundments and the restoration of degraded existing wetlands. The purpose of constructing new impoundments is to enhance the fort's attractiveness to wetland dependent wildlife. Wetlands construction for mitigation purposes is seldom necessary because wetland destruction seldom occurs. Mitigation banking is not undertaken on Fort Riley.

Nearly 101 acres of new wetlands have been constructed on Fort Riley since 1995. The most recently constructed area is a complex of 47 acres of wetland habitat in firebreak cropfields in Maneuver Area F, constructed in 1999 and 2000. That wetland complex was constructed under a 30-year Conservation Partnership established in December 1996 with Ducks Unlimited. Through this Partnership, shallow-water (less than 3 feet) wetlands are being created.

These wetlands are seasonally flooded and managed according to standard moist-soil principles. Most of the wetlands constructed under the agreement have been constructed in firebreak cropfields. Those areas have been chosen principally because they are located on the perimeter of the installation and converting those sites to wetlands is highly unlikely to impact military training activities. In addition, the areas that were chosen were adjacent to other wildlife habitat components such as creeks, rivers, and riparian corridors.

Small wetlands will be constructed during the period covered by this plan, if appropriate and contingent upon funding. Some construction will be implemented specifically to create wetlands. In other cases, wetlands will be created ancillary to tank trail construction and repair, erosion control, and mining of soil in support of other construction. One planned initiative is to construct a water control inlet structure at Threemile wetland to more effectively manipulate water levels and thus, vegetation.

8.11.2. Moist Soil Management

Seasonally flooded, shallow-water wetlands are managed according to standard moist soil principles. Impoundments are manipulated to produce different foods or to attract different groups of wildlife. The timing and speed of flooding and drawdown affects vegetation communities and, thus, the attractiveness of wetlands to different species of

wildlife. Habitats within individual wetland cells are not discreet. Rather, habitats are viewed as a continuum in space and time resulting from a gradient of water level conditions.

8.11.3. Vegetation Manipulation

Millet is planted in the summer in anticipation of fall rains refilling ponds and flooding the millet. Millet growing in dry soils after drawdowns frequently attracts wild turkeys. Fall flooding of millet provides food for migrating waterfowl as well.

The delta formed where Madison Creek enters Milford Lake has been intermittently seeded during the 1990's with Japanese millet. This program succeeded in attracting substantially larger number of waterfowl during fall migrations. However, due to the unpredictable hydrologic regime of Milford Lake and the smaller impoundments, the flooding of the millet often occurred before it reached maturity and the seed was not available as a food source for waterfowl. Therefore, this program will be continued in the future at selected impoundments that have more predictable hydrologic regimes.

Vegetation plantings have included other species. Nodding smartweed, burreed, wild rice, rice cutgrass, and wild celery were planted at the Threemile wetland. Milo has been planted around perimeters of wetlands to provide dense, high quality feed for wildlife. Also, mesic native grass species have been planted on a limited basis for waterfowl nesting. DES, Conservation Division has not planted any species, such as those belonging to the genus *Phragmites*, that have been identified as being potentially noxious or invasive.

8.12. Water Quality Management

The installation complies with all state and Federal management requirements in projects that either directly or indirectly affect the water quality of its impoundments and streams. Historically, preventing degradation of stream water quality through the management of point source discharges into streams (e.g., effluent from waste water treatment plants) has been emphasized. In recent years, the reduction of sedimentation of streams through both point source and non-point source pollution has been more important. Therefore, sites at which streams are crossed during tactical training exercises have been hardened, and vegetated filter strips have been established, where needed, along streams. Increasingly, best management practices to reduce silt transport have been used during repair and construction of infrastructure.

While Fort Riley does not produce excessive amounts of non-point source pollution now, reducing such pollution during the period covered by this plan may be necessary. The fort will also construct a consolidated wastewater treatment plant to replace its existing three plants during the period covered by this plan. That action will reduce point source pollution of Forsythe Creek and the Republican and Kansas rivers.

8.13. Training Lands Management

Training lands are critical to the Army's infrastructure and ability to train realistically. The on-going military mission depends on land conservation and long-term sustainability. The objectives of the Army's Land Management Program are as follows:

- Avoid or minimize adverse mission impacts by integrating with the capability of the land to support mission activities.

- Actively cooperate with local, state, and Federal organizations in carrying out national land use and conservation policies.

- Develop and implement the necessary programs and plans to maintain and improve the training value, environmental quality, aesthetic values, and ecological relationships of the land.

8.13.1. Integrated Training Area Management

The Army program for the integration of sustained land management and training readiness is Integrated Training Land Management (ITAM). The ITAM program mission is to integrate all land management activities to ensure compatibility of critical combat skills training and natural resources management. The two components of ITAM pertinent to Section 8.12 *Land Management* are Land Rehabilitation and Maintenance (LRAM) and Training Requirements Integration (TRI). Environmental Awareness (EA) is discussed in Section 12.2.1, and Land Condition Trend Analysis in Section 9.3.2.4.

8.13.1.1. Land Rehabilitation and Maintenance (LRAM)

The reclamation and land improvement aspects of ITAM are combined into a single program called LRAM. LRAM works to repair and improve training lands by planning and applying preventative and corrective land management practices. Unreclaimed environmental damage can result in the following:

- The loss of strategic training acreage on Fort Riley.

- The creation of safety hazards to soldiers and equipment.

- A decrease in tactical maneuverability during training.

- An increase in training site maintenance costs.

- Possible violations of environmental laws.

- The loss of vegetation and wildlife.

- The undermining of public support for the Army's mission and the continued use of Fort Riley.

LRAM uses Natural Resources Conservation Service (NRCS) standards for mulching, fertilizing, and reseeding. A combination of native grass species and one exotic species of grass (smooth brome) are used in reclamation efforts. The NRCS provides manpower and equipment to Fort Riley through a Memorandum of Agreement. Most seed is purchased commercially. LRAM activities include the following:

- Stabilizing disturbed areas formerly and currently used as trails as well as areas adjacent to the trails, by using locally quarried riprap and by revegetation.

- Establishing hardened stream crossings.

- Controlling erosion by establishing gullies with riprap, graded diversions, and revegetation.

- Using land management practices to enhance safety and training value of the land. These practices include filling, grading, and seeding abandoned defilades, hardened assembly areas, removing obstructions and safety hazards, and reporting abandoned concertina wire to Range Control.

- Monitoring soil erosion and soil compaction as part of the LTCA program.

Repair and Restoration. Few areas on the fort escape impact by vehicular traffic because of the limited available land and the installation's intense training mission. Consequently, almost all areas show disturbed soil. Nevertheless, soil erosion is minor on most of Fort Riley because much of the disturbance is relatively diffuse, i.e., it is in the form of a few to a multitude of intersecting tracks from single vehicles passing across grassland areas. However, there are areas on the post, especially along major travel routes, at staging areas, and on old homestead sites used for tactical concealment, where the vegetation is frequently disturbed. These areas are particularly abundant in those training areas lying adjacent to old U.S. Highway 77 south of the Douthit safety fan. Repair of these areas is underway through the post's LRAM activities as part of its implementation of the ITAM program.

A systematic plan was developed and implemented to repair and upgrade damaged tank trails and main supply routes (MSR's) throughout the post's training areas in hopes of reducing much of the disturbance caused by non-tactical movements of military vehicles. Under this plan, damaged routes were reconstructed, their surfaces hardened with crushed rock, and their shoulders and borrow ditches revegetated with a rapidly growing vegetation along most of their lengths. The system of tank trails and main supply routes is adequate to meet the mission needs. EPR funds have been used for the last several years to maintain the rock surface, or to harden the surface through the addition of recycled asphalt pavement (RAP). RAP applications appear to have reduced maintenance as well as dust generation. These efforts should continue if funds are available although EPR funds are becoming more difficult to obtain as these projects evolve more toward Real Property Maintenance Account (RPMA) activities than environmental protection activities.

Tactical Concealment Islands. As part of the LRAM program, ITAM personnel, in coordination with the training community have established additional woodland and shrubland habitats to increase tactical concealment resources. ITAM also coordinates with the DES, Conservation Division to ensure that compatible natural resources management objectives are also met.
During the early 1990's, prior to ITAM moving to G3/DPTM, the DES, Conservation Division attempted to increase the number of trees in and around old home sites in areas where woody cover was limited. Initial efforts were generally ineffective. In the initial attempts, black locust seedlings were planted at several home sites after they had been graded and tilled. After the trees were planted, signs were placed around the home sites designating them off-limit to training. Unfortunately, the signs were largely ignored, and the trees were inadequately maintained. Survival of the trees was consequently quite low.

After the failed initial attempts, the DES, Conservation Division, in cooperation with the Department of Energy's Argonne National Laboratory and the US Army Construction Engineering Research Laboratories developed a concept that became known as Tactical Concealment Island (TCI). Under this concept, an effort was again made to restore woody plants in old home sites. But instead of prohibiting training in the sites, the trees and shrubs were protected with visual and physical barriers. Training around them was allowed and even encouraged. TCIs re-establish or provide additional woody habitat, often in upland areas. They protect historic and other cultural resources when those features are considered in the design process. In the future, TCIs will be developed only when they will serve the mission requirements or are determined to be the best means to protect a historic site without impacting the mission.

Hardened Stream Crossings. Low-water stream crossings are sites where tactical vehicles frequently ford intermittent and perennial streams. Repeated traffic at these fording sites form depressions in the stream channel, increase erosion of the stream bank, and increase turbidity and suspended sediment in the stream. When damage becomes severe, these fording sites become impassable, and tactical vehicles are frequently stuck in the crossing.

Hardening these fording sites protects water quality in the stream, provides better access to training areas, lessens damage to tactical vehicles, and reduces lost training time. A KSU graduate research study (Sample 1996) showed that hardening some fording sites reduced total solids concentrations by a factor of 12 and reduced turbidity by a factor of 16 down stream of vehicle traffic. These data do not necessarily represent all cases of hardened stream crossings.

Two construction methods are used in hardening low water stream crossings:

- Method 1: Soft soils are excavated from the stream channel to a maximum depth of 48 inches, 18-inch mean diameter stones are placed in the channel to the original elevation of the stream bed, and a 12-inch lift of 6-inch mean diameter stones are placed on the approaches to the crossing.

- Method 2: Soft soils are excavated from the stream channel to a maximum depth of 24 inches. Woven geotextile is placed on the soil surface, and 10-inch mean diameter stones are placed in the channel to the elevation of the streambed. A 12-inch lift of 6-inch mean diameter stones are placed on the approaches to the crossing. All riprap is quarried on post.

The Fort Riley LRAM program has constructed 60 stream crossings to date, most of them by the Directorate of Public Works on Fort Riley although some were constructed using troop labor.

Construction of hardened low-water stream crossings follows designs approved by the U.S. Fish and Wildlife Service and the Kansas Department of Wildlife and Parks because of the potential impact of in-stream construction on the Topeka shiner, an endangered species. Both agencies prefer constructed crossings to uncontrolled crossings because they reduce siltation into streams. The DES, Conservation Division is working with ITAM personnel to modify the construction of approaches to hardened crossings to further reduce siltation.

8.13.1.2. Training Requirements Integration (TRI)

This element of ITAM involves working with military trainers and planners to ensure that land capability and environmental impacts are considered when planning and conducting training exercises. TRI also involves applying LRAM technology to making the training areas better able to meet the needs of the military mission.

Rotation of Training Use. Rotation of training use could be a good land management practice. However, the land base at Fort Riley does not allow prolonged rest of areas receiving vehicular use. When the Douthit Range is in operation, more than 300 days per year, there are fewer than 20,000 acres available for maneuver training use. Thus, rotation of training use on this acreage is not feasible.

In the long term, it may be better to allow concentrated training use on the level, less erodible uplands than rotating use into areas that are more susceptible to erosion. The LCTA data may be able to provide the information needed to make these training land allocation decisions.

Environmental Considerations and Damage Prevention. Preventing maneuver damage is more cost effective than repairing the damage. Consequently, certain measures and environmental safeguards are undertaken in military training to prevent damage. The major thrust of this effort is the Environmental Awareness portion of ITAM, a cooperative effort between G3/DPTM and DES led by ITAM. The major aspect of this program is the weekly Senior NCO Refresher Course (SNCORC). Senior enlisted soldiers newly assigned to Fort Riley attend this week-long class to learn about the installation and the area. ITAM hosts the class one afternoon each week and provides a course of instruction that covers maneuver damage prevention, hunting and fishing opportunities and regulations, and hazardous animals and plants in the area.

Some classes taught as part of the DES environmental training program cover some aspects of natural and cultural resource protection. Classes such as Environmental Team Training, Hazard Communication, and others devote small portions of instruction to natural resources protection measures.

ITAM or the DES, Conservation Division will take any unscheduled opportunity to speak to soldiers on environmental protection. Avenues include Officer Professional Development (OPD), NCO Professional Development (NCOPD) and Unit Safety Days.

8.13.2. Soil Resources Management

Soil resources management is literally the foundation upon which training land sustainability depends. Soil management is integrated through ITAM among the DES, Conservation Division; the Directorate of Public Works; and the G3/DPTM. The primary soil management activities undertaken on Fort Riley are revegetation and control of soil disturbances.

8.13.2.1. Revegetation

Native plant species are preferred in any revegetation plans. The only exotic perennial species ever used by the LRAM program is smooth brome. Smooth brome has been planted as an agricultural crop for more than 100 years and has proved itself as a good erosion control species with few other problems. When smooth brome seed is used for LRAM repair projects, it is always mixed with other native species to ensure biodiversity.

8.13.2.2. Soil Borrow Sites and Quarries

Soil and rock have been mined on Fort Riley for many years, probably since the land's acquisition, most of it relatively uncontrolled. Mining areas were established primarily for convenience without consideration of the useful life of the site, environmental impact, or closure needs. Sites were used for the duration of a nearby project, and then abandoned, usually without an effort to make them safe or otherwise useful. They were often reopened later when another nearby project required soil or rock.

Today, many of these inactive mining areas have rock walls, making them unsafe for troops and vehicles. Some are in highly visible areas, making them aesthetically undesirable. Nearly all have little value for most wildlife species.

A plan is under development to provide guidance on establishing, operating, closing and reutilizing mining areas to increase troop safety, increase available training space, improve wildlife habitat, and improve the appearance of the installation. This plan will identify several sites around the installation from which nearly all of the installation's rock or soil needs can be filled. The criteria and procedures for locating new mining sites, if needed, will be outlined. The goal of this plan is to provide soil and rock as needed by the installation, in a safe, economically viable, and environmentally sound manner.

8.13.2.3. Tactical Digging

Fort Riley utilizes a permitting system to coordinate tactical excavation and other ground disturbing activities during training exercises among those conducting the training, Range Control (G3/DPTM), and the DES, Conservation Division, under Fort Riley Regulation 385-12, paragraph 5-25. All tactical excavations during training exercises are managed through this excavation permitting system. Units wishing to conduct tactical digging submit a request to the ITAM Section of Range Control. ITAM prepares a GIS map and draft approval memorandum, which is then routed to the DES, Conservation Division for review of natural and cultural resource impacts. Upon DES approval, it is routed back to ITAM for final approval. ITAM and DES each maintain a hard copy record of all digging permit requests and approvals. This system, in addition to providing review for impacts on natural resources, provides compliance with the Programmatic Agreement for cultural resources management with the Kansas State Historic Preservation Office.

8.14. Cantonment Area Management

This section describes Fort Riley grounds management and maintenance operations within cantonment areas. Fort Riley has two principal planning documents for cantonment area management. They are the Landscape Master Plan (LMP) (U.S. Army Corps of Engineers, September 1987) and the Installation Design Guide (IDG) (U.S. Army, Fort Riley, Kansas, 1987). Those documents present guidelines for meeting the following objectives:

- Supporting present and future mission requirements.
- Protecting the natural beauty of the landscape and preserving environmental integrity.
- Improving the appearance of the installation and facilities by appropriate landscape development.
- Developing, initiating and maintaining progressive programs for grounds management, utilization, and conservation.

The LMP, is a 13-volume guide to landscaping the installation's improved grounds. The LMP presents background information on landscape maintenance, proper installation techniques, pruning, fertilization, and disease and pest treatment. In addition, it contains specific volumes on the primary roadway network, Main Post, Custer Hill troop housing and family housing, Marshall Army Air Field, Camp Forsyth, Colyer Manor, Camp Funston, Camp Whitside, and the former Milford Reservoir Recreation Area. For each of these areas, the LMP presents detailed site analyses and recommends specific projects. It also contains planting design guidelines with general landscape development plans.

A Programmatic Agreement (PA) has been negotiated between Fort Riley and the State Historic Preservation Officer on management of the Historic District. This agreement incorporates the Historic Landscape and Cultural Resource Management Plans by reference into the PA. The Historic Landscape Management Plan delineates the boundaries and targeted landscape objectives applied to the District. The overall objective will be the

planting and maintaining the landscape to coincide with historic landscape design, plant palettes, and possible use patterns within the landscape.

The IDG is a 13-volume complementary document to the LMP, which reinforces the prioritized list of projects. The IDG focuses on the same areas as the LMP but with an emphasis on the built environment. It presents detailed design guidelines on aspects such as building massing, form, relationship to site and response to climate; color, exterior materials, and facade articulation; additions, alterations and service functions; roadways, parking, bikeways, and walkways; and plazas/courtyards, plantings, and site furnishings.

The specific objectives of improved grounds management include the following:

- Maintaining the grounds by the most cost-effective means practical in support of the military mission
- Maintaining and improving the aesthetic quality and environmental integrity of the installation
- Conducting activities that are integrated with, and complementary to, other natural resource activities

8.14.1. Integration with other Conservation Division Programs

The improved grounds management practices offer some opportunity for integration with the other natural resource management objectives by incorporating small-scale demonstration range and woodlands management activities which environmental education as well as attracting wildlife using vegetation. The determination of the location and extent of the integration of range and forestry when guided by soil suitability can yield a desirable diversity, and an aesthetically pleasing and functional environment.

8.14.1.1. Integration with Range Management

The incorporation of range management into improved grounds management, especially the semi-improved portions, can produce economic benefits from hay and hayseed harvest leases, and by reducing costs by reducing the need for mowing.

Some of the semi-improved grounds that are currently mowed could be allowed to revert to range and native grass. These grasses, when left uncut, could improve soil protection and wildlife habitat. In addition, those actions would create a more natural appearance in many of the post's semi-improved areas.

8.14.1.2. Integration with Fish and Wildlife Management

Watchable wildlife (e.g., song birds and squirrels) habitat provides for a richer human living environment. Landscaping should improve watchable wildlife habitat by planting fruit and seed producing trees and shrubs like crabapple and hackberry for songbirds. Oaks benefit squirrels, and lilacs monarch butterflies. Although hunting is not permitted around the improved grounds, bird watching benefits from appropriate wildlife habitat. Some

consideration must be given to the effect of plants and wildlife habitat on human users. For instance, increasing habitat near housing areas can increase conflict between humans and wildlife, leading to the need for animal control. All plantings will be planned and conducted to minimize shelter for less desirable wildlife (skunks, raccoons, snakes), and to increase desirable wildlife.

8.14.1.3. Integration with Forestry Management

The incorporation of forest management in the vicinity of the improved grounds can provide watershed protection and erosion control. Woodland plantings offer an aesthetically pleasing environment as well as provide a moderating effect on microclimates. Such plantings can reduce maintenance costs and provide habitat for woodland wildlife as well as and forest products such as walnuts from black walnut plantings.

8.14.1.4. Integration with Recreation

The availability of accessible outdoor recreation facilities is an important aspect of a healthy human environment making recreational areas in improved grounds an integral aspect of cantonment areas.

8.15. Pest Management

The Army's Pest Management Program emphasizes Integrated Pest Management (IPM) as a comprehensive approach to the prevention, elimination, or control of pests. The Army's program includes these six objectives:

- Develop and maintain safe and effective programs for pest management at each installation.
- Protect real estate investments from depreciation by pests.
- Control potential disease vectors.
- Prevent damage to natural resources by pests.
- Maintain and improve operating personnel competence and skill through periodic training and testing.
- Prevent medical and economic pests from being introduced into or spread throughout the United States.

8.15.1. Installation Program

The Pest Management Program at Fort Riley is designed to employ chemical and non-chemical control measures to achieve effective pest control with minimal environmental effects. Pest control is needed to prevent interference with the military mission and to minimize nuisance pest infestations among post inhabitants and the general public.

Pest management responsibilities at Fort Riley are shared with the Medical Department Activity (MEDDAC). The Directorate of Environment and Safety assumes leadership for many of these activities through the coordination efforts of the Installation Pest Management Coordinator (IPMC). The Preventive Medicine Service (MEDDAC) is charged with the overall goal of maintaining the health and safety of all personnel on Post. Regarding pest management, MEDDAC's primary task is pest surveillance in association with sanitation and maintenance inspections. Work is allocated using annual work plans/master schedules for the contractor and the golf course superintendent, the post pest control facility, and the DES, Conservation Division.

Many environmental laws and regulations guide the development of pest management programs at Fort Riley. Another crucial consideration is the DoD/Army pesticide use reduction goal as explained in Section 8.14.3. Certified pest management personnel and licensed and certified contractors implement these programs.

8.15.2. Objectives

Objectives for pest management emphasize human dimensions but also include a substantial component for maintaining ecosystem integrity and biological functions. Disease vectors, wildlife disease control, and pests related to hygiene are all human related. Control of feral animals and exotic pests primarily maintain ecosystem integrity. The objectives for pest management are as follows:

- Protect human health and safety
- Effectively use Integrated Pest Management (IPM) techniques to minimize pest resistance and risks to environmental damage from improper pesticide applications
- Protect Army and adjoining private property
- Protect state agricultural interests and the livestock industry
- Protect natural resources, ecosystem integrity, and native bio-diversity.

8.15.3. Integrated Pest Management

The Department of Defense in general, and Fort Riley specifically, are committed to following all applicable environmental regulations while conducting activities under the Pest Management Program. The principles of Integrated Pest Management (IPM) serve as the foundation for all activities described within the Integrated Pest Management Plan.

Integrated Pest Management means using the best mix of available control methods for achieving the most effective, economic, and environmentally safe pest management possible. Pesticides have been used as the primary control historically, but exclusive dependence on them limits their effectiveness and creates additional problems. These problems include increased resistance to pesticides leading to subsequent pest resurgence

or the emergence of new pests after their natural enemies or competitors are decimated. Increasing prices and more stringent safety precautions, and the DoD Memorandum of Merit #2, which targets a 50 % reduction in pesticide use by FY2000, means pesticide applications are becoming more expensive. For these reasons, the Fort Riley IPM program seeks to minimize pesticide use. Chemicals are used only when necessary, and applications are made in an effective and specific manner.

Fort Riley has an Integrated Pest Management Plan (DES 2000) that provides guidance for operating and maintaining an effective pest management program. The principles of IPM are stressed in the plan, and the information in the plan, along with adherence to the IPM principles, ensure effective control measures. The Integrated Pest Management Plan is incorporated by reference into this plan. It is revised each year, as required by Army Regulation 200-5, by the Installation Pest Management Coordinator with assistance from other installation natural resources managers.

The Integrated Pest Management Plan is consistent with current military standards and criteria and is designed to be consistent with the mission of the post. Compliance with the plan will ensure that proper regulatory procedures have been followed. The plan prescribes the roles and responsibilities of the various departments, organizations, and personnel actively involved in the application, storage, and use of pesticides at Fort Riley. It also identifies the existing pests at Fort Riley and characterizes their destructive abilities, so appropriate decisions can be made to satisfy any particular level of control.

8.16. Fire Management

There are two major aspects to fire management on Fort Riley. The first priority is to prevent and fight the spread of wild fires to protect people and property. The second is to manage fire to maintain ecosystem integrity. Two components pertain to ecosystem management. The first is to apply prescribed burning to manage and improve native grasslands. The application of prescribed burning to manage Fort Riley rangelands was discussed in Section 8.3.3.1. The second is to protect woodlands. These considerations are taken into account in developing annual Fire Management Plans, which are kept on file in the DES, Conservation Division Office.

Signs, posters, special public awareness forums, and the installation newspaper are the prescribed media for the dissemination of timely fire prevention slogans and information. ITAM's Environmental Awareness program informs soldiers during the fire seasons of the dangers of wildfire and their role in preventing them. A safety bulletin and newspaper articles about soldier safety during the prescribed burning season are published each spring.

8.16.1. Prescribed Burning

Prescribed burning as a tool for range management was described in detail in Section 8.3.3.1. The following section discusses other aspects of prescribed burning within the context of overall fire management.

Conservation Division and Fire and Emergency Services Division personnel carry out all prescribed burning. The Range Technician conducts an annual prescribed burning safety training session for all Conservation Division personnel involved in burning or wildland fire fighting while the DPW Fire and Emergency Services Division provides appropriate training for its personnel. All personnel involved in conducting prescribed burning and wildland firefighting are "Red Card" (Federal Wildland Fire Fighter) certified.

Areas besides range areas are sometimes burned at other times to accomplish specific goals. The most common example is burned firebreaks, sometimes established to prevent the unintentional burning of large areas during periods when certain training activities having a high potential to generate fires and undertaken during dry periods. Areas adjacent to housing are burned on occasion to reduce fire hazards. Such deviations from the standard are considered thoroughly for their potentially adverse impact on the resource.

Current practices and protocols for prescribed burning, including the increased emphasis on protecting high-value woodlands (Section 8.15.2), will continue during the period covered by this plan except that more late-summer burns may be necessary to facilitate control of the noxious weed, sericea lespedeza.

8.16.2. Woodland Fire Protection

Woodland areas of Fort Riley are not contiguous, but scattered throughout the reservation primarily in riparian corridors. This large edge of interspersion with the grasslands makes the woodland areas vulnerable to fire damage. Prescribed fires as well as wildfires sometimes encroach, which can create long-term damage to trees resulting in increased disease and mortality and reduced forest resource quality. Fires have damaged more than 200 acres of the post's woodlands. In recent years, greater emphasis has been placed on controlling prescribed fires to prevent their encroachment into high-value woodlands, or, at least, to reduce the intensity of fires that do encroach by increasing firelines and backfires and by more carefully choosing conditions under which to burn grasslands adjacent to those woodlands.

8.17. Special Interest Area Protection

There are areas or zones that require special management or protection emphasis. Designated critical habitat for threatened and endangered species is protected as described in the installation's Endangered Species Management Plan. Selected areas of savanna are protected through careful control of prescribed fires within them, and wooded areas adjacent to streams (Streamside Management Zones) are protected both by careful planning and selective timber harvests.

8.17.1. Savanna Area Management

Savannas are coming under increased consideration in their benefits to the region. The targeted management for savannas is to maintain the prairie and tree species interface through the use of periodic prescribed fire occurrences. Existing tree species which provide thorns for use by loggerhead shrike, such as black locust (*Robinia pseudoacacia*)

and osage orange (*Maclura pomifera*) will be maintained in savanna locations. Savanna management must be balanced with the habitat needs for the greater prairie-chicken (*Tympanuchus cupido*) that requires the removal of scattered perch trees for raptor predators. Certain locations will receive the removal of trees through the use of felling and herbicide applications.

8.17.2. Riparian Areas

Riparian areas are the natural vegetation types and sites along water courses. They are considered critical areas for protection of water quality as well as important wildlife habitat. The riparian corridors associated with the Kansas and Republican rivers, in particular, are important areas for neotropical migratory birds.

Riparian corridors along the Kansas and Republican rivers are protected as state-designated bald eagle habitat. Certain activities within the state-designated critical habitat are further restricted by the installation's ESMP. Corridors along streams where Topeka shiners inhabit or potentially inhabit also receive protection under the installation's ESMP that controls activities in a 50 foot buffer strip adjacent to the streams.

DES, Conservation Division has undertaken projects to restore or establish new riparian habitat. A planting of native trees, shrubs and grasses was conducted in 1999 along Wildcat Creek to restore vegetation buffer strips that had been gradually reduced by agriculture lessees. This planting restored and enhanced the riparian corridor along approximately nine miles of Wildcat Creek. A contract to establish new woodland habitat along Kansas River was begun by contract in 2000. The planting consisted of eastern cottonwood, American sycamore, bur oak, chinquapin oak and pecan. More than 1,200 trees were planted. Additional similar plantings will be undertaken during the life of this plan, as necessary, to protect or restore vegetation buffer strips.

8.17.3. Streamside Management Zones (SMZ)

Virtually all of the forested land at Fort Riley is associated with the drainageways. Forest management within the immediate area adjacent to streams and rivers is managed with specific attention given to measures that will protect water quality and beneficial uses.

Streamside management is tailored to the specific needs of the site (i.e., slopes, presence of wetlands, and ground cover density) to minimize soil erosion and sediment load moving into the stream. Measures that may be used include non-harvest or selection harvest along the area adjacent to the watercourse, control of runoff by eliminating overland flow along the stream border, planting of wattles (bundles of willow branches along the streambank), or other means. Streamside Management Zones that use non-harvest as a mechanism to reduce stream sediment loading will require a band of timber to remain uncut up to 100 feet from the streambank. This management tool will normally be used on patch harvests. Selection harvests of individual mature and over-mature trees will be performed along streambanks but only at infrequent intervals. Removal of an individual tree has a negligible effect on stream quality.

9.0 INVENTORYING AND MONITORING

Natural resources are inventoried to determine their presence, relative abundance, and distribution to structure a biologically appropriate ecosystems management strategy that also meets human needs and the military mission. Inventories describe the "what," "where," and "when" of natural resources. These include biotic resources such as flora, fauna, special communities (e.g., wetlands and timber resources), and abiotic resources such as hydrology, soils, and topography. Inventories may be rigorous and systematic or may be incidental and intermittent. This section of the plan describes inventories undertaken at Fort Riley to allow appropriate decisions to be made about the management of its natural resources as described in Section 8.

Data obtained from inventories and monitoring form the basis for understanding ecosystem's composition, structure, and function. These data are often the best scientific data available for Fort Riley and the region as well. Data also are used in an adaptive fashion to adjust or modify either overall management frameworks or annual management practices and plans. Annual adjustments, in particular, occur for those resources used consumptively such as fish, wildlife, and timber. Data from inventories and monitoring actions also provide a measure of accountability to determine the effectiveness of management practices in achieving specified objectives.

The installation has completed Planning Level Surveys of its soils, threatened and endangered species, vegetative communities, surface waters, flora, topography, fauna, and wetland in accordance with DoD Conservation Measures of Merit (MoM) (memo dated 16 May 95 and updated 29 Jan 96) and Army Policy (memo dated 21 March 97). Funds are requested as an Environmental Program Requirements (EPR) (Project FRY089S015, Update Natural Resources Management Plan) to provide updates of one planning level survey every other year.

9.1. Objectives

The program's objectives call for the following actions:

- Inventory those Fort Riley natural resources that are considered important indicators of the following:
    - overall ecosystem integrity
    - capability of lands to support military missions
    - renewable product surpluses
    - status of sensitive species and habitats
    - and other special interests

- Regularly monitor those resources to determine trends, distribution, and impact of land uses upon those important resources.

- Apply inventory and monitoring data to implement adaptive ecosystem management strategies.

9.2. Flora Inventory and Monitoring

An initial Planning Level Survey of the installation's flora was completed in 1985, when the vegetative characteristics of the entire installation, excluding the permanent impact area, were described and mapped. The installation also plans to complete an installation-wide floristic Planning Level Survey during 2002 and 2003. Other inventories of specific plants and plant communities and efforts to monitor the fort's flora have been undertaken since 1985.

9.2.1. Land Condition and Trend Analysis (LCTA)

Land Condition and Trend Analysis is an element of the ITAM program. LCTA provides a long-term assessment of changes in the botanical composition and cover across the Fort as well as estimates of associated soil loss under varying levels and kinds of uses. This program is based on the principle of sustained use of military land resources.

The application of LCTA began on Fort Riley in 1990. Annual LCTA monitoring began in 1993. LCTA consists of monitoring 162 transects located throughout the fort. Conditions monitored at those transects include changes in vegetation, soil condition, and faunal populations. Sixty of the 162 transects have had avian and small mammal surveys conducted on them also (see Section 9.3 *Faunal Inventory and Monitoring*).

The fort is beginning rigorous analysis of that data during 2001 and expects to continue to collect information from those (or similar) transects through the life of this plan. No analysis of the vegetation data is yet available.

9.2.2. Woodland Inventories

Fort Riley woodlands can be classed as both forest and woodland types. Also included in tree cover is savanna and degraded grassland areas that have encroachment of weed trees infiltrating native grasslands.

9.2.2.1. Forest Inventory

Fort Riley's forest conditions have been inventoried several times since 1987. The most recent inventory was initiated in 1997, and field measurements were completed in 1998. Personnel shortages have prevented full analysis of the data from that survey. The fort expects to complete that task in 2002. Information will include forest mensuration, habitat suitability for selected wildlife species (fox squirrel, bobcat, downy woodpecker, turkey, quail, wood duck, and spotted bass), and fuel load of individual stands. Woodland and forest cover types total approximately 16,200 acres.

9.2.2.2. Savanna Inventory

An inventory of Fort Riley's savannas was conducted in 1999. Sizes, locations, plant associations and characteristics of the savannas were determined. Compilation of this information has not yet been completed. Savanna areas were determined to have at least 5% and less than 15% tree cover, on slopes from zero to nine percent. At least 42 locations were identified as having savanna like characteristics. At least 11 other locations fell close to the parameters of the classification. Additional data on Fort Riley Savannas are located with the Management Agronomist in the Conservation Division.

9.2.3. Natural Community Evaluation

The Kansas Biological Survey completed a report entitled, "*Natural Community Analysis of Fort Riley Military Reservation*" (Lauver, Feb 1994, KBS Report #59), to provide data useful for integrated natural resources management to protect and maintain native communities and their processes. Specific objectives of the project were to (1) classify recent digital LANDSAT data to produce a general land use/land cover database of Fort Riley and (2) conduct field surveys of selected natural communities and collect biological data to determine their natural quality. This project characterized the vegetation and natural communities by analyzing multi-spectral digital LANDSAT data.

The report concluded that Fort Riley contains a variety of high quality natural communities that extend across the post. Results indicate that the dominant vegetation type is grassland and that large areas contain Flint Hills Tallgrass Prairie in good to excellent natural condition. Several examples of high-quality upland forests were located on the southern end of the post, whereas only small patches of high quality wetlands were found. The report is on file at the DES, Conservation Division.

9.2.4. Habitat Evaluation

A number of surveys and research projects have evaluated wildlife habitat on Fort Riley. The more recent surveys, conducted in the 1990's, have included GIS layers as final products as well as hard maps.

Kansas State University-Division of Biology completed a study in 1997 to determine landscape and fine-scale vegetative parameters associated with breeding loggerhead shrikes and Henslow's sparrows (Michaels, 1997). The purpose of this study was to complement the KBS model for loggerhead shrikes and to investigate Henslow's sparrow habitat associations.

The Kansas Biological Survey (KBS) completed a project in 1996 to identify and delineate loggerhead shrike habitat on Fort Riley (Lauver et al., 1996) for the purpose of classifying suitable shrike habitat. An existing model for assessing the suitability and availability of shrike breeding habitat in the upper Midwest was modified using remote-sensing to predict shrike habitat. Data were ground-truthed to determine accuracy of the assessment. A Graphical Information System (GIS)-based model and a set of map overlays depicting shrike habitat were produced. Specific objectives of the study are discussed in the report, which is on file at the DES, Conservation Division.

The U.S. Fish and Wildlife Service completed a National Wetlands Inventory in 1994 according to USFWS standard procedures. Remote sensing identified wetlands, and then ground-truthing of a sample of wetlands was completed. This NWI is used for planning but is not accurate enough to use to delineate jurisdictional boundaries for permitting requirements. A GIS data layer is available for DES personnel.
An engineering/planning firm under contract evaluated in 1982 the installation's habitat for five game species: bobwhite quail, ring-necked pheasant, eastern wild turkey, prairie-chicken, and white-tailed deer. Selected portions of the installation were also evaluated for songbirds and/or wood ducks. Maps were developed using GIS showing the habitat's value to those species before and after suggested wildlife management actions.

Unfortunately, no documentation of the criteria used to determine habitat values was provided. Furthermore, "ground-truthing" of the maps by the DES, Conservation Division staff indicated that they are inaccurate (e.g., suggested food plot sites were in some cases located in rocky or otherwise unsuitable areas). The maps were not used, and implementation of any of the recommended actions has been merely coincidental.

9.3. Faunal Inventory and Monitoring

Surveying and censusing Fort Riley's fish and wildlife and collecting of harvest information require substantial effort. Monitoring fish and wildlife populations requires personnel and until recently inadequate staffing has been a problem. Beginning in the mid-1990s, added staff began conducting expanded surveys. In particular, surveys of fish populations, threatened and endangered species, and non-game wildlife were greatly expanded. Annual Wildlife Monitoring Plans (1999 through 2001) are developed by the installation’s Fish and Wildlife Administrator and are on file at the DES, Conservation Division. The plans will be updated annually during the life of the INRMP.

9.3.1. Population Monitoring

Surveys of fish populations, game, and threatened and endangered species are routinely conducted. DES, Conservation Division primarily conducts these surveys, but DPTM personnel through the LCTA portion of the ITAM program conducts long-term surveys of flora and fauna on Fort Riley. DES, Conservation Division has on file data collected since the early 1980’s regarding various populations of wildlife.

9.3.1.1. Fish

Fish population monitoring is primarily related to the sport fishery program on Fort Riley. Sport fish populations and species assemblages are systematically monitored in 29 lakes and ponds. Creel surveys are conducted intermittently depending on captor availability. Creel surveys provide an indirect measure of fish populations.

Fish population dynamics in managed ponds and lakes are monitored by several standard methods. Populations are surveyed with electrofishing equipment, as well as seines, and gill, trammel, and trap nets. Electrofishing is conducted in the spring; test netting and

seining is conducted during the fall. Data are analyzed by means of several standard fishery indices (e.g., Proportional Stock Density and Swingle's F/C ratio).

A graduate student (Quist) was funded at Kansas State University in 1996 through DoD's Legacy program to conduct a study of fish assemblages in Fort Riley streams. During the two year study, the student sampled fish at several reaches of a number of streams on the installation. This sampling, coupled with a literature search, indicated that 51 species of fish occur in Fort Riley's rivers and streams. These include one Federally-listed endangered species (Topeka shiner), one state-listed endangered species (speckled chub), and two Species in Need of Conservation (blue sucker and plains minnow).

9.3.1.2. Game

Populations of six principle game species on Fort Riley are monitored. Objectives vary from obtaining annual indices of population trends to obtaining specific population parameters such as numbers and age and sex ratios. Some population data are derived from the harvested animals themselves.

Surveys that have been conducted are described below. Additional population monitoring methods that may be implemented during the period covered by this plan, depending on availability of personnel, include spotlight counts of deer, upland game bird brood surveys, and auditory survey of turkeys. All of those methods would provide information for fine-tuning management of the installation's wildlife.

Upland Game Bird Surveys
Spring surveys are conducted for prairie-chicken, bobwhite quail, and ring-necked pheasant. Prairie-chicken surveys count directly numbers of leks and numbers of birds on the lek to yield population numbers. Auditory surveys of quail and pheasant yield indices of population trends and do not enumerate population size directly. They are used only for annual comparative information. These surveys have been conducted annually since 1982 and will continue through the life of this plan.

The overall objective for these three surveys is to assess long-term population trends. Data derived from upland game surveys are not used to adapt annual harvest frameworks or bag limits for each subsequent hunting season. However, information is provided to hunters who expect a fall hunting forecast.

Bobwhite Quail. Spring whistle counts, with 3 replications, are conducted in June along four standardized routes. Procedures and data analyses are standardized from year to year. These procedures and analysis methods are on file at the DES, Conservation Division.

Ring-necked Pheasant. Spring crow counts are conducted in May along four standardized routes with 3 replications. Procedures and data analyses are standardized from year to year. These procedures and the analysis method are on file at the DES, Conservation Division.

Greater Prairie-chicken. Prairie-chicken lek counts are conducted from late March to late April. Lek counts are made on each Maneuver Area. Standardized routes are not run.

Each Maneuver Area is surveyed twice. Active leks are located by sound and counted. If time is available, flush counts are made on each lek. Lek counts are considered more accurate for assessing populations than are flush counts of leks. Numbers of birds on a lek can vary greatly from day to day, but the numbers of leks remain stable throughout the breeding season.

Surveys prior to the mid-1990s were conducted along standardized routes because insufficient personnel did not allow a complete canvassing of each Maneuver Area. Some leks were undoubtedly missed because lek locations vary from year to year.

Big Game Surveys
Elk monitoring is more rigorous because they are reintroduced species that requires conservation management while tailed deer and turkey populations are monitored primarily during hunting season. Furbearers, however, are not routinely surveyed.

Elk. Elk have been surveyed since their reintroduction in 1986. Aerial surveys were conducted intermittently until 1997 when a systematic protocol for conducting the surveys twice annually was established. These procedures and the analysis method are on file at the DES, Conservation Division. Data collected also are on file.

The specific objectives of the surveys differ somewhat, depending on the season during which the surveys are conducted. The primary objectives of winter surveys are to determine total population size and to determine antlered-to-antlerless ratios. The primary objectives of summer surveys are to obtain cow-to-calf ratios and antlered-to-antlerless ratios. A secondary objective of the survey during both periods is to obtain a breakdown of age classes of bulls.

The overall objective for elk surveys is to obtain population information for the establishment of an appropriate harvest framework. These data are used to recommend harvest quotas to KDWP, and KDWP uses the data to establish long-term management strategies for this herd. The annual aerial surveys are expected to continue throughout this plan.

Elk populations also are monitored through harvest. Hunters are not required, but are encouraged, to bring harvested elk to the Conservation Division Office. Antler measurements are taken based on the Boone and Crockett protocol and pictures are taken of the animals. The age structure of the harvested segment is determined by tooth cementum annuli analysis.

White-tailed Deer. The annual firearms deer check station is the primary source of information on Fort Riley deer herd. Various morphometric and reproductive data are collected from harvested deer and are used to assess the deer herd's condition and reproductive potential. Age and sex data reflect population parameters and, thus, reflect potential population dynamics.

Body condition and fecundity are monitored to assess herd condition. Although not objectives *per se*, body condition and doe-to-fawn ratios are monitored as benchmarks. Fort Riley does typically carry two fetuses each. This indicates a deer herd in good condition that is increasing in size.

Biologists collect teeth for tooth cementum annuli analysis to determine an accurate age structure of the herd. Antler measurements are taken to compare against age data as a reflection of herd's condition. Antler data indicate number of points, main beam circumference at the pedicle, and inside spread at the widest point. Body weights are another indicator of herd condition that is recorded. Blood samples and reproductive tracts from harvested deer also are taken and analyzed. Serological tests are conducted for the presence of disease.

The information collected is summarized and reported to the KDWP for tracking the statewide harvest. DES, Conservation Division compares data from year to year to obtain harvest and condition trends.

Turkey. Monitoring of turkey populations is limited to data collected during the spring hunting season. Hunters are asked to report the body weight, beard size, and spur length of the turkeys they harvest. These data are compiled and summarized and used to make comparisons from year to year.

One of the most important sets of information is the proportion of jakes (last year's male poults) in the harvest. This indicates reproductive success from the previous year. If the proportion of jakes remains high year after year, this reflects an increasing turkey population. Harvest success is taken to indicate population trends assuming that increasing populations will translate to increased harvest success.

Furbearer Survey.
Furbearer populations are not routinely surveyed. However, their relative abundance has been estimated during two research projects conducted by the Kansas State University-Division of Biology. The first project involved estimating and assessing quantity of "sign" along major streams bisecting the installation (Robel 1987). More recently, a scent station survey was begun in 1996 and continued through 2000 (Page 1998, Kamler 1999 and Synder 2000). The objective of these intermittent efforts is to provide descriptive information about furbearer populations.

9.3.1.3. Threatened and Endangered Species

Federally- and state-listed species have been inventoried, and Federally-listed species are monitored as part of overall compliance with the Endangered Species Act. Population monitoring objectives for Federally-listed threatened and endangered species are specified in the Endangered Species Management Plan.

Surveyed species, the bald eagle, least tern, piping plover, and Topeka shiner, are monitored each year to assess abundance and distribution as well as seasonality of occurrence and habitats used on the installation. This information is used for management

as well as compliance, specifically, to assess the effects of the Army's actions and to develop Biological Assessments. Monitoring will continue throughout the life of this plan so long as these species remain Federally-listed and may continue if they are delisted, if personnel resources allow.

Historically, bald eagle surveys conducted on Fort Riley have searched open water habitats. The DES, Conservation Division staff intermittently performed aerial surveys from 1982 to 1990 consisting of a one-time helicopter fly-over of the Republican and Kansas rivers, from Highway 77 to Marshall Army Airfield. All eagles observed were counted and identified as adult or immature. In 1990-1991, the U.S. Fish and Wildlife Service (USFWS) conducted bi-weekly ground surveys on the Republican and Kansas rivers and on Milford Reservoir from December to mid-March. All eagles observed were counted and identified as whether adult or immature, and weather conditions at the time of survey were recorded.

DES, Conservation Division personnel began systematic annual surveys in 1993 using the protocol established by the USFWS in previous surveys. A nocturnal roost was discovered as a result of these surveys in 1994. Two surveys were then initiated: a Diurnal Habitat Utilization Survey and a Nocturnal Roost Utilization Survey. Each survey is conducted from 15 October to 15 March annually. The specific protocol of each survey is discussed in annual reports on file at the DES, Conservation Division. The objectives for the diurnal survey are to determine 1) which areas of Fort Riley are most utilized by bald eagles during daylight hours; 2) whether this utilization changes over time; and 3) how eagle numbers fluctuate throughout the winter.

The objectives of the nocturnal roost survey are to determine 1) how many eagles roost on Fort Riley and where; 2) under what weather conditions roosts are most utilized; and 3) for which winter dates eagles roost on the Fort. Data have been rigorously collected and statistically analyzed relative to nocturnal use and have contributed greatly to the understanding of the use of Fort Riley for roosting.

Surveys to locate least terns and piping plovers on Fort Riley were initiated in 1994 as part of an overall Riverine Bird Survey. Survey sites provide a view of the sandbar and beach habitats on the installation. Approximately 40% of Milford Reservoir's shoreline on Fort Riley is surveyed, and more than 76% of riverine sandbar habitat is surveyed. This includes more than 90% of sandbar habitat along the Republican River and approximately 60% of habitat along the Kansas River. Surveys are performed between 1 April and 15 May and 10 July and 15 September. Other shorebirds or waterbirds of interest, such as black terns, are recorded as well.

The first systematic, extensive surveys for Topeka shiners occurred in 1991. The USFWS used a minnow seine to survey Wildcat, Little Arkansas, Wind, Four Mile, Three Mile, Timber and Rush Creeks on Fort Riley during that summer. No Topeka shiners were found, although the USFWS reported the presence of apparently suitable habitat in a number of survey areas.

Annual surveys of all Fort Riley streams by DES, Conservation Division personnel began in 1995. These surveys followed protocol used by the USFWS and KDWP, which consisted of identifying the fish and recording only the species present. Such a sampling design allowed for personnel to conduct many surveys and to sample all streams on the installation in a timely matter, but did not provide the means to collect detailed population data. Topeka shiners have been located in three streams as a result of these surveys; Wildcat, Little Arkansas and Seven Mile Creeks. In addition, a graduate student performing research on Fort Riley found one Topeka shiner in Wind Creek.

Future surveys for Topeka shiners will be conducted annually in streams in which this species has been found. Surveys will be conducted a minimum of two out of every five years in streams in which Topeka shiners have not been found. The objectives of these surveys are to determine 1) Topeka shiner presence; 2) fish species assemblages; 3) the density of the various species; 4) water flow values; and 5) qualitative information of silt loads. Data will be recorded as needed to meet these objectives. Additional data during surveys may be collected if new information indicates such efforts to be warranted.

Numerous other surveys are conducted for a variety of state-listed or rare species throughout the year. Henslow's sparrow, loggerhead shrike, regal fritillary butterfly and prairie-mole cricket are monitored either systematically or incidentally to other fieldwork. Henslow's sparrows have been systematically monitored since 1994. Data indicate that Fort Riley supports one of the largest breeding populations in the United States. In addition, data derived from this effort directly contributed to the USFWS decision not to list this species. Systematic monitoring of the loggerhead shrike was conducted by the Kansas State University-Division of Biology graduate students (1995 to 1997) as part of research on shrike habitat use. DES personnel surveyed the prairie mole cricket in 1992 and in 1998 for the USFWS by listening for calling males.

Future monitoring of these species that occur will be vary. Henslow's sparrow surveys can continue to provide additional management data, particularly about prescribed burning and haying. Annual population data provides an excellent comparison to future populations on the installation. Prairie mole crickets will be monitored every other year until 2010. Loggerhead shrikes and regal fritillary butterflies will be surveyed incidentally to other fieldwork but will not be systematically surveyed.

Several species have not been observed on the installation but could potentially occur. Thus, the objective of monitoring is simply to record their presence if it occurs. Whooping crane surveys are conducted annually by observing the river from high points on adjacent hilltops. The American burying beetle was systematically surveyed by using pitfall traps from 1995 to 1998. These systematic searches were suspended after 1998 after failure to document any of this species. Some species such as the western prairie fringed orchid and white-faced ibis also are searched for incidentally to other fieldwork.

Future searches for species potentially occurring on the installation will be secondary to monitoring efforts for occurring species. Except for the whooping crane, searches will be incidental to other fieldwork.

9.3.2. Neo-Tropical Migratory Birds and Other Non-game Wildlife

An ecosystems approach requires a wide variety of fauna to understand ecosystem functions. Neotropical migratory birds are monitored by DES, Conservation Division staff, by staff with the ITAM program and by staff with the Institute for Bird Populations.

9.3.2.1. Birds

The DES, Conservation Division, conducts breeding bird surveys annually. These surveys provide invaluable information regarding game and nongame species and the presence/absence of species of special concern. Additional population monitoring is conducted through the LCTA portion of the ITAM program. The distribution and abundance of small mammals and birds have been monitored at each of 60 transects each spring since 1990. The methods used in conducting these surveys are fully described in the LCTA Interim Report (U.S. Army Corps of Engineers, 1991).

The Institute for Bird Populations (IBP), under a contract through the Legacy Program of the Department of Defense, established permanent sampling stations for birds on Fort Riley during the summer of 1993. These stations have been sampled annually since then. These stations were established as part of the Monitoring Avian Productivity and Survivorship (MAPS) program. The stations are located within riparian woodland and prairie habitats to collect population data on neotropical migrant and permanent resident bird species. The data acquired from this long-term survey are used by the DES, Conservation Division staff to assess forest and prairie management practices. Volunteers began taking over this work from the IBP in the summer of 1999.

Winter raptor surveys are conducted along four standardized routes each year from 1 January to mid-March. The surveys are performed in accordance with Raptor Vehicle Census Survey Guidelines (Army Technical Manual No. 5-633). The objectives of the winter survey are (1) to identify concentrations and distributions of winter raptors; (2) to monitor relative abundance of species; (3) to document threatened and/or endangered or rare species; (4) to monitor year-to-year changes in raptor densities and diversities; and (5) to monitor changes in raptor densities and diversities during winter months. Winter raptor surveys will continue throughout the period covered by this plan.

9.3.2.2. Bats

Bat surveys have been conducted intermittently since late 1996. The first survey was conducted in the fall of 1996 under the Conservation Assistance Program sponsored by the Army Corps of Engineers-Waterways Experiment Station. Subsequent summer surveys were conducted annually thereafter, except during 2000. Surveys conducted from 1996 to 1998 were performed primarily in the improved grounds and in historic buildings. Surveys were expanded in 1999 to include unimproved grounds. Bat surveys will continue during the period covered by this INRMP.

Survey methods for bats include use of a bat detector, direct observation, and direct capture. Mist nets are used on the outside of bat roosts and where bats are likely to visit at night. Roosts are identified by Fort Riley Pest Managers and by the presence of guano

and urine. Mist nets are also put up over creeks, at the edge of timber, and along lakes and ponds. A bat detector is used to determine the presence of bats in an area. Bats are also hand-captured at roost sites. Bat houses are checked for use, and the species are identified.

9.3.2.3. Amphibians and Reptiles

Surveys for reptiles and amphibians have mostly been intermittent and non-systematic, except for one conducted by the Kansas Biological Survey in 1994. A survey of calling amphibians was initiated in 1999 and will be continued through 2005. The DES, Conservation Division plans to conduct annual capture surveys beginning in 2002 to maintain a current species list of the different reptiles and amphibians that occur on Fort Riley. Surveys will be designed to locate particularly two species of snakes: the western hognose, and the timber rattlesnake. Each is listed by the State of Kansas as being a Species in Need of Conservation (SINC). Amphibians will be monitored as well.

9.3.2.4. LCTA Avian and Small Mammal Inventories

The LCTA procedure contains methods for inventorying avian and small mammal populations as well as measuring vegetation. Sixty of the 162 transects are designated as wildlife plots. Avian counts are conducted using a modified point count method on all 60 plots. Small mammals are monitored using Sherman-style live traps distributed in a specified pattern paralleling the vegetation transect line. The number of transects sampled for small mammals has varied greatly since 1990, ranging from as few as 7 to as many as 60 because of training land availability, weather, and personnel availability.

Avian surveys have been conducted by LCTA since 1990. Surveys begin in late May or early June based on arrival of dickcissels in the area. Morning and afternoon/evening surveys were conducted from 1990 to 1999. Surveys are done by one observer between sunrise and 1000 hours and 1900 and 2100 hours, on days without rain or strong wind. Afternoon surveys were terminated in 2000. The survey method employed is a modified point count during which the observer will record all birds heard or seen within 100 meters of the transect. The observer has been the same for all plots in a given year. There have been four observers over a ten-year period.

Preliminary analysis of trends in bird populations has been performed by KSU-Division of Biology and Department of Statistics (Althoff et al 2001). Data analysis excluded waterfowl, shorebirds, raptors, swifts, swallows and galliformes (grouse-like) birds. These are birds not likely to have breeding territories within size of sampling unit. Also excluded were species detected three or less years. In all cases, this resulted in the exclusion of species detected in five or fewer plots total for a ten-year period. Trends of 51 species were analyzed. Results were compared to state, regional and national trends from the Breeding Bird Surveys (BBS).

“Presence-Absence” analysis was used to derive trends in total species richness, mean species richness (number of species detected per plot, average of all plots), and species-by-species (proportion of plots having at least one individual detected per plot). Trend analysis over the ten-year period was based on two classifications: 1) the typical habitat

each species uses for nesting and foraging, and 2) its migratory status (i.e. resident, short-distance migrant, or long-distance –neotropical migrant). Fourteen species were categorized as grassland, 6 as shrubland and 31 as woodland.

Preliminary analysis suggests that total species richness is steady over a ten-year period (1991 –2000), averaging 45 species (range 41 – 50). Mean species richness appears to be declining from a high of 8.9 species/plot in 1992 to a low of 4.0 species/plot in 1999. The decline in mean species richness began in 1993.

Analysis by habitat suggests that among grassland species, only one (the common yellowthroat) increased. Six of these species decreased and the remaining seven species remained steady. Among shrubland species, most remained steady (4 of 6 species) or declining (2 species). The majority (23 of 31) of woodland species appeared to be steady and eight appear to be declining.

Analysis based on migration status suggests that proportionately fewer long-distance migrants are in decline at Fort Riley compared to resident and short distant migrants. Among resident birds, populations of 8 of 11 species remained steady and 3 of 11 decreased. No resident species appeared to be increasing. Seven of 13 short-distance migrants remained steady and the remaining 6 decreased. The majority of long-distance migrants remained stable. Only one species (common yellowthroat) showed a slight increase.

The overall trend was that most species remained stable or declined regardless of habitat or migration assemblages. According to Althoff et al (2001), declining trends observed for many species are consistent with Kansas, regional and national trends for most trend indicators.

LCTA also uses the above-mentioned 60 transects for small mammal trapping. Methods used for small mammal trapping have varied from year to year. The emphasis during the last several years has been to find a rigorous and appropriate methodology and have it become the standard. Small mammal trapping is more labor intensive then the avian surveys. It requires at least two people. Captured mammals are weighed and measured, and marked at first capture. Two sizes of Sherman style live catch traps currently are being used. Personnel conducting the survey must be outfitted with personal protective clothing and respirators to protect against hanta virus. Part of the protection process includes washing all possibly contaminated traps in a bleach solution while in the field. Sufficient data has not been collected to analyze long-term trends of small mammal populations on Fort Riley.

9.3.3. Wildlife Disease Monitoring

Monitoring wildlife disease is important because wildlife can act as reservoirs and/or vectors for diseases that infect humans, domestic pets, and livestock. Human health is obviously important, but the protection of the Kansas livestock industry is also a critical consideration. Because diseases of wildlife can cause large-scale mortality, they could potentially affect population management decisions. Continued monitoring for the

diseases described below will be an integral component of the wildlife management program.

Harvested deer are screened for economically important diseases or those diseases that cause severe mortality in ungulate populations. These are brucellosis, epizootic hemorrhagic disease, and bluetongue. Serological testing for leptospirosis has been conducted intermittently. The two hemorrhagic diseases are endemic to the population as is leptospirosis. Brucellosis, however, has not been found during any serological testing.

An overall health assessment of feral swine was conducted in 1993 to 1995 (Gipson et al., 1999). This assessment found the swine to be generally healthy, although serological evidence indicated that some individuals had been exposed to parvovirus, enterovirus, and swine influenza. Neither swine brucellosis nor pseudorabies was detected. Detecting either of these diseases would require notification to the U.S. Department of Agriculture and Kansas Department of Animal Health and possible federal quarantine.

Fort Riley cooperated with the state in 1998 to obtain brains of harvested deer and elk to screen for Chronic Wasting Disease (CWD) (spongiform encephalopathy). None of the brains showed signs of CWD. Fort Riley also has sponsored Kansas State University-College of Veterinary Medicine for monitoring ectoparasites of mammalian predators with home ranges near housing areas on-post, which are ecological interfaces between pets and wildlife.

Fort Riley also tests wildlife found sick or dead. In particular, wild mammals capable of carrying rabies are tested routinely when they are found sick. Canine distemper is another disease that is monitored in raccoons, coyotes, foxes, and other wild hosts because it can infect unvaccinated domestic dogs.

MEDDAC personnel monitor wildlife as potential disease vectors of humans. Personnel assist at the annual firearms deer check station to collect ticks to survey for diseases such as Lyme's disease and human ehrlichiosis. Personnel from Fort Sam Houston surveyed small mammal populations for hantavirus in 1994. Hantavirus was detected in 2% of the small mammals sampled.

9.3.4. Wildlife Harvest Monitoring

All persons hunting upland game, waterfowl, deer (with a bow or with muzzleloading rifles outside of the firearms season), elk, and turkeys are required to complete and submit a harvest record card each day they hunt. These cards are deposited by the hunters at nine unmanned, self-service check stations on the fort. Game harvest and angler/hunter participation are monitored to assess a variety of biological and non-biological elements related to harvest management strategies. The elements assessed are efficacy of harvest management strategies (including stocking rates), monitoring of population parameters and wildlife health, and determination of hunter/angler demographics and satisfaction.

Firearms deer hunters must check in at a manned check station each day they hunt. This requirement provides Fort Riley managers with an accurate count of hunters and a count of total number of days afield. Hunters are required to bring harvested deer into a check station. This system provides a very accurate reflection of harvest rates for deer as well as time and location of the kill.

Angler activity and fish harvest have been monitored by creel surveys or with required reporting. Prior to 1996, anglers fishing at Cameron Springs (the installation's trout pond) were required to complete a survey form each day they fished. The forms were available at an unmanned check station located at the pond's entrance. The requested information included the number, size, and species of fish caught; length of time spent fishing; and rating of the fishing. This requirement was lifted in 1996, and a creel survey was instituted that year because a creel survey provides better management information.

9.3.4.1. Fish and Wildlife Kill Investigation

Fish kills have occurred occasionally in Moon Lake and Cameron Springs, each of which was due to an overflow from adjacent wastewater treatment plants. The waters were immediately closed for angling until the problem was fixed and the waters deemed safe after testing by MEDDAC-Preventative Medicine personnel. MEDDAC-Preventative Medicine personnel monitored the water quality until the waters are declared safe for recreation.

The DES, Conservation Division staff investigates reports of deer and elk mortalities appearing out of season or under suspicious circumstance (e.g., males with heads cut off). The PMO is notified if the kill appears illegal.

9.4. Aquatic Surveys

Fort Riley has recently begun monitoring stream ecology. Two research projects through the KSU Division of Biology were initiated in late 1990s that included monitoring. These two projects are described in Sections 10.2, *Research Projects*. Previously, aquatic surveys were non-systematic and intermittent.

Further, the Kansas Department of Wildlife and Parks monitors selected streams on Fort Riley as part of a state-wide program to monitor and assess streams throughout the state. These surveys have been conducted every two years since 1990. Results of these surveys are discussed in Section 6.7.3, *Surface Water Quality*.

In addition the DES, Installation Restoration Program (IRP) monitors the water quality of the Kansas River. Water level, water temperature, barometric pressure, and precipitation data are collected. Water level data are recorded by 21 data-collection platforms (DCP) from 4 surface-water sites and 38 monitoring wells or piezometers. Periodic and continuous ground- and surface-water-level data are collected, analyzed, and used to model ground-water flow. The ground-water flow model is used to characterize directions of ground-water flow, assess the interaction of ground and surface waters, and estimate aquifer parameters. Water-table maps are produced that show spatial variation in ground-water elevations at a point in time.

9.5. Soils and Geological Surveys

The soil surveys used by the DES, Conservation Division staff are those completed by the U.S. Department of Agriculture Natural Resources Conservation Service (formerly the Soil Conservation Service). The first surveys were published in 1975. Surveys were updated after more sampling in 1993. These surveys are available for Riley, Geary, and Clay counties as handbooks. GIS layers have been constructed as well.

A geomorphological survey was completed in 1998 to reconstruct the paleoenvironment of Fort Riley. The purpose of this reconstruction study was to develop geological perspective on past cultural activities as they relate to climate, climatic change, and topographic location.

Erosion and deposition throughout the Quaternary (geologic time from 1.6 million to 10,000 years ago) has produced a record that is fragmentary but can yield useful empirical data. This information is derived from a comprehensive analysis of the alluvial (stream deposited sediments) and eolian (wind deposited sediments) depositional episodes and the modifications imposed by pedogenesis (soil formation).

There are three essential pieces to this reconstruction. The first is the paleoclimatic indicators. The deposition of loess (homogeneous, non-stratified, unconsolidated, wind-laid deposit of silt) is given as indicative of colder, glacial times. Pedogenesis points to more quiescent, warmer interglacial periods. The second is the identification of stratigraphic (sequence of layers) and chronostratigaphic (stratigraphic entities based on established time indicators) correlations based on topographic, lithologic, and radiocarbon (age determination) data. The final factor is that upland loess and valley fills were the principal late Quaternary deposits and as such, were the most productive resources-rich landscapes for prehistoric exploitation, the richest being the valley fill sequence.

The study demonstrates that an effective combination of stratigraphic correlation, landform mapping, and chronostratigraphic correlation can enhance the probability of locating subsurface archeological resources. It also delineates the possibility that certain cultural periods could be expected to be associated with specifically defined landforms.

9.6. Data Storage, Retrieval, and Analysis

Automation provides enormous capability to retrieve and store virtually any data related to natural resources management. Furthermore, automation provides the capability to rapidly manipulate large volumes of data and to make complex queries comprising several sets of data. The types of monitoring and inventory data stored and used by Fort Riley natural resources managers cover many aspects of land and wildlife management. Data are stored on hard drives and on back-up CD’s that are stored in fireproof safes at locations other than the primary computer.

9.6.1. Microcomputer Systems

Personal computers (PCs) and ancillary hardware are standard equipment at the DES, Conservation Division. All staff is provided a microcomputer system at their personal workspace. Most PCs contain Pentium (or equivalent) processors for rapid handling and analysis of many types of non-graphic environmental data. PCs also are fundamental to accomplishing administrative duties and routine office work. Upgrades of hardware and software are timely and ensure the most modern system.

9.6.2. Geographic Information Systems

GIS allows the storage and manipulation of large volumes of spatial and relational data such as maps, aerial photographs, and satellite imagery. Data can be displayed and printed. The two primary uses of GIS are to make complex queries and to produce maps. GIS has become critical for assessing the application of various management practices on natural resources.

The first GIS at DES operated GRASS Software on an Intergraph UNIX Platform. Currently, there are two GIS available to the DES, Conservation Division. Both systems operate with ESRI ArcView or ArcInfo software supported by either Sun UNIX or standard Windows-based PC platforms. Global Positioning Systems (GPS) are used to collect field data that is directly downloaded into the GIS. One system is located at the DES Headquarters the second is located at the DES, Conservation Division.

10.0 RESEARCH AND SPECIAL PROJECTS

Research is conducted on Fort Riley to provide scientific and statistically rigorous data for analysis in order to do the following:

- Assess effects of the military mission on natural resources.
- Assess and evaluate the effects of natural resources management decisions.
- Enhance the understanding of natural resources functions for adaptive management.

10.1. Research Mechanisms

Fort Riley cooperates with various entities including academic institutions, the Oak Ridge Institute for Science and Education, the AEC and CHPPM to conduct scientific research directed to Fort Riley specific natural resources management issues. The fort primarily uses two mechanisms: academic institutions and the Oak Ridge Institute of Education and Science.

10.1.1. Academic Institutions

The Kansas State University-Cooperative Fish and Wildlife Research Unit (U.S. Geological Survey) has conducted several rigorous research projects sponsored by Fort Riley. Some research has also been performed by contract with Kansas State University.

10.1.2. Oak Ridge Institute for Science and Education

The U.S. Army Environmental Center (USAEC) has established a formal Memorandum of Agreement with the U.S. Department of Energy (DOE) for participation in the Oak Ridge Institute for Science and Education (ORISE) program.

The program includes technical training for future environmental professionals, both during formal academic education and as postgraduates. The Postgraduate Environmental Management Participation Program provides those seeking or recent recipients of associate, bachelor, master, and doctorate degrees, or postdoctoral credentials in an appropriate science or technology discipline to participate in related research and development activities associated with USAEC or Army installations. The program is intended to enhance the participants' background and experience and allow them to contribute to their chosen field of study.

The Fort Riley DES, Conservation Division has participated in the ORISE Postgraduate Environmental Management Participation Program since 1995. Eight ORISE Participants have received postgraduate technical training participants in all major aspects of ecosystem management.

The ORISE program has offered an excellent opportunity for career development in the environmental sciences while at the same time it has provided an excellent mechanism to support Fort Riley Natural Resources management. Additionally, several of the ORISE Participants have been employed permanently by the Army. The ORISE projects are discussed below.

10.1.3. Legacy

The DoD Legacy program has been used to fund research pertaining to natural resources management at Fort Riley. The most significant and recent of these projects, jointly administered by the Kansas Department of Wildlife and Parks and the Kansas Cooperative Fish and Wildlife Research Unit was the Stream Fish Assemblage study completed in 1999 by a Master's student at Kansas State University. In addition to the thesis, Fort Riley received a public awareness brochure on the importance of streams to the Fort Riley environment. This brochure included a list of fish known or projected to occur on Fort Riley.

10.2. Research Projects

Both academic research projects and ORISE projects are discussed below.

10.2.1. Academic Research

KSU-Division of Biology (Cooperative Fish and Wildlife Research Unit) has conducted several research projects resulting in graduate degrees (Master's of Science and Ph.D.) for students. The Coop Unit was chosen for these projects because it is a Federal entity (U.S. Geological Service) with the expertise, technical ability, equipment, and facilities to

conduct scientific research. Results of these projects have been presented in refereed, scientific journals and at professional conferences. These projects are discussed below.

10.2.1.1. Evaluation of Food Plot Planting

A graduate research project, consisting of two complementary parts, to evaluate the biological efficacy of food plot planting began in 1993 and in 1997, resulted in a doctoral dissertation.

The goal of the first phase was to determine the effect of food plots on winter survival on northern bobwhite survival. The objectives of this first part were to 1) determine the proportion of bobwhite mortality attributed to hunting for bobwhites near and far from food plots; 2) examine overwinter survival of bobwhites near and far from food plots; and 3) examine movement patterns and habitat use of bobwhites near and far from food plots. Radio-telemetry was used to accomplish these objectives. Data were collected from 554 radio-collared quail over three winters.

The goal of the second phase was to determine the availability of various seed sources in food plots for consumption by birds and to determine relative bird abundance in food plots. Samples of seed on the ground and on standing vegetation were collected monthly from September through February, to determine the biomass available for consumption by bird species. Relative bird abundance was estimated by line transect method. Three surveys were conducted monthly during the same period.

10.2.1.2. Determination of Habitat of the Loggerhead Shrike and Henslow's Sparrow

A second graduate research project 1) determined the status of loggerhead shrikes and Henslow's sparrows on Fort Riley; 2) identified habitat characteristics for each species within occupied areas compared to unoccupied areas; and 3) determined habitat availability of the two species on the installation. The project was conducted during three field seasons from 1994 to 1997. The conclusions of the project were 1) annually to shift locations of burning and haying, 2) military disturbance did not apparently affect use of habitats, and 3) Henslow's sparrows were associated with habitats that had been burned within the last three years.

10.2.1.3. Mapping and Monitoring of Military Disturbance Using Satellite Remote Sensing.

The objectives of another graduate research project were to 1) develop a map of grassland community types for Fort Riley; 2) identify areas disturbed by military training activities; 3) develop protocols for monitoring these disturbed areas through time; 4) identify and map areas of management concerns on Fort Riley such as abandoned agricultural land, hayed areas, and burned areas; and 5) test whether multiple analysis would provide better accuracy than single analysis. The conclusions of this research were 1) boundaries between prairie-forest ecotones can be identified remotely, 2) disturbed prairie communities can be distinguished from undisturbed communities, 3) remote sensing

could accurately identify various management concerns, and 4) prairie plant communities cannot be identified with consistency.

10.2.1.4. Evaluation of Interspecific Relationships of Mammalian Predators

A KSU-Kansas Cooperative Fish and Wildlife Research Unit research project to determine niche partitioning among coyotes, bobcats, raccoons, skunks and opossums on Fort Riley was conducted 1995-1999. The multi-year project consists of two complementary phases conducted by two Master's of Science students. An adjunct component of this project is to assess the health status of the predators through serological evaluation and assessment of parasites.

The first phase was a radio-telemetry study to determine 1) home ranges, movements, and survival rates of radio-collared animals; 2) relative abundance of various predator species by designing and conducting track counts and scent station sampling to augment telemetry data; and 3) establish factors affecting predator abundance, niche partitioning, and the relative importance of those factors. The second phase was to determine food habits through scat analysis, energetics, and time-budget analysis of radio-collared predators.

10.2.1.5. Ecology of Feral Swine

In 1993, the KSU-Kansas Cooperative Fish and Wildlife Research Unit collaborated with the DES, Conservation Division staff and the U.S. Department of Agriculture-Animal Plant Health Inspection Service-Wildlife Services to study the ecology of a recently discovered population of feral swine on Fort Riley. The overall purpose was to understand the ecology of this population to control the population more effectively.
A comprehensive integrated approach has been taken to assess and monitor the health of the population. This monitoring, critical in determining the health risk to Kansas's domestic livestock industry, has not shown any pseudorabies or swine brucellosis in the population. The study resulted in a scientific paper published in the *Journal of Wildlife Diseases.*

Ecological research has determined population dynamics by discovering age structure (as determined by tooth cementum annuli analysis of swine taken during control) and uteri examination of sows. Understanding population dynamics contributes an assessment of population growth and effectiveness of control.

10.2.1.6. Pesticide Reduction

Another research project with KSU is underway to determine and evaluate best management practices in controlling pests, reducing chemical usage, and minimizing negative effects on the environment. The Memorandum of Merit #2, Pesticide Usage Reduction by 50%, highlighted the need to improve methods and effects of installation pest control. The research evaluated pre-study control of pests versus newer chemical and application technology and non-chemical pest control. New chemical technology was evaluated against past chemical controls as well as various application rates and

delivery systems were for reducing pesticide quantities while maintaining acceptable control levels. Potential for ground water contamination and negative effects were also within the scope of the study.

10.2.1.7. Characterization Fish Communities in Streams

The purpose of another study (1997-1998) was to monitor stream fish assemblages and how vehicle crossing during military training affect the physicochemical attributes of streams. Sampling sites were selected along major drainages on the installation, and physical habitat and fish communities were sampled and monitored. Results indicated the importance of large-scale disturbance from military training and woody-riparian vegetation to instream habitat and fish community structure and function. Riparian areas apparently failed to filter surface runoff and decrease sedimentation. This was likely due to the presence of numerous stream crossings that disrupted riparian continuity and provide access of silt to streams.

10.2.1.8. Rapid Bio-Assessment of Fort Riley Streams

A current project (begun in 1999) develops stream bio-assessment methodologies in order to derive an efficient, and moderately simple, sampling protocol for describing stream morphology and fauna. Stream habitat and fish and insect communities are monitored at four improved stream crossings (fords) that accommodate vehicles and tanks. Seasonal surveys occur upstream, downstream, and on the stream crossings; reference sites are surveyed during the same period. This research evaluates training maneuver disturbance to streams, spatial and temporal variability in fish and insect communities, and the efficiency of sampling methods; all evaluations are necessary for ITAM personnel to monitor aquatic systems more effectively and to better make resource management decisions.

10.2.2. ORISE Research Projects

ORISE research projects have emphasized applied natural resources management. Projects involve research on topics including fish and wildlife habitat, wildlife population management, and forestry and riparian and aquatic restoration.

10.2.2.1. Wetland Development and Use of Artificial Nesting Structures

Two wetland areas were developed and artificial nesting structures established in 1995 and 1996. The objective of this project was to monitor and document waterfowl reproduction as a response to the establishment of the wetlands and associated nesting structures. Waterfowl use of wetlands was observed during spring migration and during reproductive periods. A variety of species were observed using the developed wetlands immediately following the impoundment of water. Artificial nesting structures showed no use by waterfowl the first breeding season. The study suggested that use by waterfowl might not justify the investment of manpower and time except for goose nesting platforms that were readily used.

10.2.2.2. Determining Relative Abundance of Selected Species of Mammalian Predators

A pilot program during 1996-1997 was successfully integrated into a research project conducted by KSU study for determining the relative abundance of coyotes, bobcats, raccoons, skunks, and opossums using scent stations. Ten transects, each containing nine or ten stations were established and run during February, May, September and November. Scent stations appeared useful to determining relative abundance among various predator species and showed differences among seasons and habitat.

10.2.2.3. Radio-Telemetry of Reintroduced Elk

Radio-telemetry of 18 elk reintroduced in 1994 was conducted for two years. The objectives of the study were to determine home range and daily movements, habitat use and preference, and survival rates. The radio collars included a mortality mode for signaling the death of an animal.

10.2.2.4. Alternatives for Supplemental Winter Feeding of Wildlife

A two-part project was conducted to determine availability of seed resources in food plots during late winter and to investigate other practices for the delivery of supplemental winter food. The project was conducted for two winter field seasons (1996/1997 and 1997/1998).

The first part entailed sampling and weighing the amount of grain remaining on milo seed heads throughout winter months. Results showed that very little grain remained during the critical months of December, January, and February.

The second part of the study consisted of investigating the efficacy of feeding alfalfa hay (for elk) and using feeding tubes for quail. The study determined that elk did not use the alfalfa hay consistently and concluded that it was not cost effective to feed supplemental hay. The use of tube feeders by quail appeared to be a consistent and an effective means of supplying supplemental grain to various bird species. However, the number of feeders needed to make a biological difference to the post-wide population could be excessive.

10.2.2.5. Inventory of Freshwater Mussels of Fort Riley

Eighteen sites in eleven streams and rivers on Fort Riley were sampled for freshwater mussels during the summers of 1998 and 1999. Streams sampled included the Kansas, Republican, and Smokey Hill rivers, as well as several tributaries in prairie uplands. A total of 75 mussels were collected alive. Fresh and weathered bivalves were collected at 7 additional sites. This was the first such survey ever conducted on Fort Riley and contributed significantly to understanding of mussel assemblages in this part of the state.

10.2.2.6. Determining Bat Species Assemblages on Fort Riley

A project was conducted from May through September in 1998 and 1999 to assess bat populations. Bats were mist-netted at several locations on Fort Riley. This project was the first to evaluate bat assemblages on Fort Riley. The only species captured was the

little brown bat, despite an intensive sampling effort. Capture data are on file at DES, Conservation Division.

10.2.2.7. Evaluation of Stream Buffer Strips

A research project was developed to meet the requirements established in the installation's Endangered Species Management Plan for the Topeka shiner. The primary objectives were to map those areas along Topeka shiner streams that require restoration and/or expansion of vegetation buffer strips. Ortho-digital aerial photographs were reviewed to find those areas apparently lacking suitable buffer. Those areas were ground-truthed and measured precisely. Then vegetation was planted to create new strips or enhance existing buffer strips.

10.2.2.8. Forest Ecosystem Inventory

Planning level surveys of forest vegetation are being completed. The project will allow the installation to update the forest inventory from the original 1989 Forest Inventory. The updated project incorporates measurement of wildlife habitat characteristics of the woodlands.

10.2.2.9. Savanna Ecosystem Inventory

A seldom considered resource in this region, the savanna, was evaluated. The inventory methods and application require non-typical procedures to locate and measure the resource. The data collection of this inventory is complete, but the analysis of data is not yet completed. An additional investigation of fire effects on ecotonal areas is needed to further determine the geographical extent and appropriate management of these areas. The installation is seeking Legacy funding for the proposed study.

11.0 LAW ENFORCEMENT

Effective law enforcement is a critical component of an overall natural and cultural resources management program. Effective enforcement maximizes compliance with Federal and state laws and regulations and Army and Fort Riley regulations by recreationists. One of the most important aspects is protecting fish and game populations and other natural resources (such as fuelwood) from over-harvest, protecting threatened and endangered species from harassment, preventing felony theft of timber, and protecting sensitive habitats. Law enforcement officers also play a critical role in public safety, ensuring non-interference with the military mission by recreationists, and education of the public.

11.1. Objectives

The objectives of an effective conservation law enforcement program at Fort Riley are as follows:

- Enforce laws and regulations implementing the natural and cultural resources management program at Fort Riley

- Protect natural and cultural resources from illegal activities

- Ensure safe co-use of the installation for military training and by natural resources recreationists on Fort Riley

11.2. History, Authority, and Operations

Military Police Specialists conducted natural resources law enforcement under the authority of the Provost Marshal's Office prior to 2000. The number of MPs assigned to the Game Warden Section varied from zero to five throughout the year. Generally, only 1 or 2 MPs were assigned during the summer and the largest number were on duty during the fall hunting seasons. MPs received only informal training from the Fish and Wildlife Administrator and cooperating Conservation Officers from the Kansas Department of Wildlife and Parks. Many had no background in hunting and fishing and turn-over was high.

As a result of the installation's 1998 Environmental Compliance Assessment System (ECAS) inspection, Fort Riley's Garrison Commander authorized the installation to establish a full-time, civilian Conservation Officer position. The position was filled in January 2000. The civilian officer is under the authority of the DES but is assigned to the PMO on a day-to-day basis. A Memorandum of Agreement (MOA) was established in February 2000 between the DES and the PMO to establish the framework for cooperation between the two activities.

Military Police Specialists will continue to be assigned to conservation law enforcement to assist the civilian officer. This combination of civilian-military officers provides sufficient staff to accomplish duties within budget constraints and at the same time provide some continuity to the enforcement program.

11.3. Jurisdiction

Jurisdiction is shared jointly with Kansas Department of Wildlife and Parks and the U.S. Fish and Wildlife Service. Law enforcement officers from these two agencies have the authority to come on Fort Riley and enforce applicable Federal and state laws and regulations. KDWP Conservation Officers frequently interact with the installation's Conservation Officer and MP's. KDWP officers have cooperated with PMO personnel and USFWS special law enforcement agents to investigate poaching cases on-post and cases of poaching by soldiers off-post. They do not have the authority to cite individuals for violations of Fort Riley regulations. Only Military Police and the civilian conservation officer have that particular authority.

Federal magistrate court is used to adjudicate civilian violators who are issued DA 1805 citations. Military violators are issued, in most cases, DA 1408 citations. Military violators are dealt with under the Uniform Code of Military Justice by their Commanders. The Staff Judge Advocate assists with dealing with all violators..

11.4. Enforcement Activities

The installation's civilian Conservation Officer and Military Police routinely patrol the installation, including the range area north of Vinton School Road. These personnel routinely check hunters and anglers for possession of required licenses and permits as well as bag and creel checks. Special operations such as check points during hunting seasons and the use of decoy deer during firearms deer season have been conducted. It is anticipated that these types of activities will continue. Check points have been set up and run by PMO during upland game bird season.

Evidence and observations indicate that the most frequent violations of laws and regulations have involved failure of hunters to complete daily registration forms, failure of anglers to abide by creel limits, recreation in unauthorized areas, and theft of timber and fuelwood. Failure to possess state and installation permits occurs more frequently with anglers than with hunters. Hunters during the 2000 season had a high rate of compliance with Army Hunter Education Requirements.

The Provost Marshal's Office, KDWP and the USFWS investigated two cases of poaching big game during the last two years. Also, twice during the last five years, KDWP has run a deer decoy in cooperation with PMO during the firearms deer season. The existence of the civilian conservation officer is thought to have significantly reduced these and other violations of Fort Riley regulations and Federal and state laws and regulations.

11.5. Training

The civilian conservation officer completed the Kansas State Law Enforcement Academy soon after being hired. The officer also has attended the two-week Fort Riley MP Training Academy, during which he qualified with handguns and shotguns and received other law enforcement training.

The civilian officer will also be trained at the Federal Law Enforcement Training Center (FLETC) in Georgia. A two-week follow-up course provided by the USFWS will complete the academic requirements for this position. Training in archeological protection also will be provided through FLETC. Two members of the Cultural Resources staff within DES, Conservation Division and one member of the PMO investigations staff have attended this FLETC training.

In-service training is an important part of maintaining certification of the civilian officer. The officer must obtain 40 hours of training annually to maintain certification. For example, the officer will attend workshops sponsored by KDWP law enforcement.

Basic law enforcement training for MPs is derived from military training for this Military Occupational Specialty (MOS). Conservation law enforcement training for the MPs will continue on the job, under the leadership of the civilian officer. FLETC and Kansas certification are not options for military personnel due to FLETC rules and Kansas regulations.

12.0 ENVIRONMENTAL AWARENESS

Fort Riley recognizes the critical importance of education and environmental awareness to a comprehensive natural resources management program. Fort Riley is committed to education for soldiers within the training scenarios and community outreach as well as the specific objectives listed below.

12.1. Objectives

The objectives of the post's education and public awareness efforts are as follows:

- Provide information and educational materials to the military, general public, and other requesters regarding Fort Riley's native ecosystem and its management within the mission framework and DoD and Army policy.

- Enhance educational efforts as a compliance element within the installation's Endangered Species Management Plan.

- Provide information and explanatory material to users on recreational opportunities at Fort Riley.

- Provide information and educational materials to recreational users on safety and non-interference with the military mission.

- Promote Conservation Programs through the development of awareness campaigns, posters, brochures, newsletters, press releases, school programs, and partnerships.

- Continue to develop new ideas for community outreach and seek opportunities for promoting Conservation Programs.

- Continue to partner with Fort Riley schools on Outdoor Wildlife Learning Sites (OWLS) projects; develop two more sites by 2004.

- Provide natural resource education, Arbor Day, and other programs to schools as requested and as personnel are available.

12.2. Military Personnel Awareness

Many venues for educating the soldiers about natural resources management exist through DES, Conservation Division and G3/DPTM. Additionally, the Public Affairs Office supports educational outreach by publishing articles in the weekly post newspaper.

12.2.1. Environmental Awareness (EA)

The ITAM EA program is intended to minimize damage to training lands and to protect the environment by fostering a conservation ethic in soldiers and their leaders. G3/DPTM personnel accomplish this through the use of videotapes, handbooks, posters, cards, and

briefings. In addition, each of the approximately 40-50 Senior NCO Refresher Course (SNCORC) each year includes information about natural and cultural resources management and protection. Information about hunting and fishing and other natural resources related recreation also is presented. In addition to SNCORC classes, ITAM EA personnel frequently receive requests to make presentations to units at Safety Days, Officer and NCO Professional Development classes, and other venues. ITAM EA personnel also have obtained the environmental briefing materials from the National Training Center (NTC) and conduct pre-deployment briefings for units.

12.2.1.1. Recreational Information

The soldiers and their families are key customers served by the DES, Conservation Division, and information on recreation is geared toward these stakeholders. Various educational materials provide basic information about hunting, angling, and fuelwood cutting. The DES, Conservation Division personnel are available during regular duty hours to answer the questions and concerns of these key customers.

12.2.1.2. Threatened and Endangered Species Awareness

A critical element of Fort Riley's Endangered Species Management Plan is to greatly expand awareness of these species and the requirements for protecting them. The plans require development of materials to educate recreational users on the species of concern on Fort Riley, how to properly identify the species, and what habitats they utilize. The plans also encourage reporting of suspected observations.

The DES, Conservation Division personnel will continue to provide briefings and talks, detailing prohibited and controlled actions required for the protection of species, to soldiers, contractors, maintenance crews, and others who work on Fort Riley. Personnel will also continue to make presentations at special events such as *Eagle Days* at Corps of Engineers' lakes. The environmental awareness program of ITAM educates military personnel on the presence of endangered and threatened species and provides any other applicable information important to preserving these species during training activities.

12.3. Community Outreach

Proper implementation of a natural resources management program requires the cooperation of surrounding communities.

12.3.1. Media Presentations

Newspaper and magazine articles relating to fish and wildlife conservation and other natural resources matters have been written by the staff of the DES, Conservation Division since 1979. News articles are submitted for publication in Fort Riley's weekly newspaper, *"THE POST."* The DES, Conservation Division has had a weekly column, "The Wildside," in the paper since 1984 to provide timely information on conservation and recreation. News releases also are distributed through the Post Public Affairs Office to local newspapers and occasionally to other media such as daily newspapers in Kansas City, Topeka, and Wichita.

Members of the DES, Conservation Division appear, on occasion, on Fort Riley's cable television program. The program appears on Fort Riley and on Manhattan and Junction City cable television channels. Local television in Wichita and Junction City have featured segments on the Fort Riley-Ducks Unlimited Conservation Partnership and related waterfowl habitat projects. DES, Conservation Division personnel appear on television an average of twice a year.

Local radio stations request interviews with DES, Conservation Division personnel about twice a year as well. The interviews usually cover hunting and fishing opportunities on the installation. In addition, the Ducks Unlimited Partnership and wetlands development has generated strong interest among local radio stations.

12.3.2. Printed Information Distribution

The DES, Conservation Division produces many publications for distribution on Fort Riley. These include booklets, brochures, hunting/fishing maps, regulation summaries, and hunting/fishing tips. The DES, Conservation Division also distributes brochures, pamphlets, and other publications produced by the KDWP, the USFWS, the KSU Cooperative Extension Service, the Audubon Society, National Rifle Association, and others. At any time, walk-in customers can find 30 to 50 free conservation-related publications at the DES, Conservation Division.

The most widely distributed brochures are those describing hunting, angling, fuelwood cutting and other outdoor recreation on post. These include the following: *Summary of Fort Riley Hunting Regulations, Summary of Fort Riley Fishing Regulations, Fort Riley Hunting Guide, Fort Riley Fishing Guide, Fort Riley Outdoor Recreation Guide,* and *Fort Riley Fuelwood Guide.* These six brochures are updated annually and describe the most pertinent rules and regulations on Fort Riley. Additionally, Fact Sheets covering all forms of big game hunting on-post are updated annually and distributed widely. These materials also are distributed through the Outdoor Recreation Center; the hunter check station network, an information stand in the main DES building (building 407); and at some of the ITAM EA information centers located across the post.

Fort Riley produces for distribution several brochures and booklets that describe natural resources on post. *Reptiles and Amphibians of Fort Riley and Vicinity* is a 72-page booklet with color plates co-produced with Kansas Biological Survey in 1996. A *Checklist of Fort Riley Birds* was produced in 1997 with funding from the Legacy program. *Stream Resources on Fort Riley Military Reservation* is a brochure co-produced with Kansas State University as a component of a graduate research project completed in 1998. The brochures *Endangered Species on Fort Riley* and *Hazardous Animals and Plants of Fort Riley*, both of which have color plates of species of interest, are also widely distributed. A “Wildlife Caution” brochure was produced in 2001 to educate residents about nuisance wildlife in housing areas. The purpose of the brochure was to reduce human-wildlife interaction and conflict.

12.3.3. Special Events and Programs

DES, Conservation Division staff present briefings, slide shows, and talks to many groups throughout the year. Tours of natural resources projects are given to various conservation and civic organizations and professional groups when requested. For example, the Kansas Riparian and Wetlands Alliance and the Kansas Chapter of The Wildlife Society have toured the Ducks Unlimited wetland sites. The Rocky Mountain Elk Foundation takes an annual tour of Fort Riley to view how funding provided by the group has been used on the installation. Other community outreach programs include supporting *Armed Forces Exposition* and annual *Eagle Days* and *Earth Day* activities.

12.3.4. Youth Development

Teaching a conservation ethic to children is the means of ensuring future understanding and appreciation for ecological processes, natural resources management, and recreational pursuits with respect to natural resources. Fort Riley natural resources personnel provide to children in elementary and secondary schools many programs about conservation and future careers in the sciences. The DES, Conservation Division personnel support a high school internship program through PAO on fish and wildlife management.

Personnel annually conduct a week-long series of programs for local elementary students for Environmental Education Enrichment Days, sponsored by the Geary County Fish and Game Association. A National Wildlife Habitat Judging Contest, comprising 4-H and extension students, toured Fort Riley in 1999 to view habitat management practices. Children's Fishing Derbies are supported during annual Kids Fishing Day-Hooked on Fishing, Kids 2000, YES, and various science clubs. Programs for at-risk children are a part of this effort.

An Outdoor Wildlife Learning Site (OWLS) was established at one of Fort Riley's elementary schools in 1995. The OWLS site is part of a formal program supported by Kansas Department of Wildlife and Parks. The Fort Riley DES, Conservation Division maintains the site to showcase various wildlife habitat practices. The DES, Conservation Division has provided personnel, supplies, animal houses, and plant materials to this OWLS project. In 1988 the Garrison Commander provided approval and guidance to develop two more OWLS projects by 2004.

12.4. Watchable Wildlife

Non-consumptive pursuits are an important element in Fort Riley's wildlife-related recreational program. Fort Riley supports the largest free-ranging elk herd in the state, which consequently, has generated much interest. Fort Riley also encourages bird watching, hiking and nature photography.

12.5. Professional Interaction

Professional interaction is another element of community outreach that demonstrates installation efforts in and Army and DoD support for natural resources management. The

major emphasis is on ecosystems management efforts and presenting results of research. Tours and presentations have been provided to the Kansas Chapter of The Wildlife Society, American Fisheries Society, the Great Plains Section of the Society of American Foresters, and Kansas Weed Supervisors Association.

The DES, Conservation Division has provided coordination, support, and funding to conduct rigorous scientific research on post. Graduate students have presented results of Fort Riley research projects at national, regional, and state professional conferences. DES, Conservation Division personnel have co-authored two professional papers published in refereed journals. In addition, DES, Conservation Division staff has routinely presented papers to the Department of Army, state and regional natural resource professional societies, and other professional conferences.

12.6. Volunteer Activities

DES, Conservation Division personnel frequently volunteer off-duty time to further the causes of natural resources management and resource conservation. Many staff members are volunteer hunter education instructors and teach classes in the Manhattan and Junction City areas. Some are involved in national conservation organizations such as Ducks Unlimited, Quail Unlimited, and the Rocky Mountain Elk Foundation as committee members, or as officers in local chapters or organizations. Staff members have been involved as instructors for "Becoming an Outdoors Woman" and "Women in the Outdoors programs", 4-H Shooting Sports, and other such programs.

When staff members volunteer for such activities, they are typically introduced as employees of Fort Riley, even though they are not acting in that capacity. Such public exposure reflects very positively upon the installation.

13.0 OUTDOOR RECREATION

Army regulation 200-3, Chapter 7, provides the primary guidance for outdoor recreation programs and opportunities. These regulations take precedence over AR 215-2 (*The Management and Operation of Army Morale, Welfare and Recreation Programs,* and *Nonappropriated Fund Instrumentalities*). AR 200-3 specifies that "that the appropriate environmental directorate will address the biological management of game species and natural resources while the Directorate of Community Activities (DCA) addresses the movement of persons, special events, and organizations elements of outdoor recreation."
Army Regulations define outdoor recreation as those programs and activities that depend on natural resources. Examples explicitly stated are hunting, fishing, hiking, and bird watching. Though authorized by other regulations governing the sale of salvage timber, fuelwood cutting is another recreational activity that is particular to Fort Riley. Regulations specifically exempt "developed or constructed activities such as golf courses, lodging facilities, boat launching ramps or marinas."

13.1. Objectives

Fort Riley's vision of natural resources-related outdoor recreation, throughout the life of this plan, is to maintain a program that is consistent with Fort Riley's military mission and with native ecosystem integrity and biological functions. Natural resources-related outdoor recreation on Fort Riley recognizes consumptive and non-consumptive uses of natural resources. Consumptive uses include biological, recreational, and military carrying capacities. The objectives listed below are established to meet that vision:

- Maintaining funding for hunting and fishing recreation by
    - ♦ Continuing to seek Conservation Partnerships to leverage installation funds to support hunting and fishing recreation at current levels.
    - ♦ Maintaining an income from the sales of hunting and fishing permits at an annual baseline of $32,000.00.
- Maintaining participation in hunting and fishing at current levels by
    - ♦ Supporting at least 5,000 hunting trips.
    - ♦ Supporting at least 20,000 days of angling in lakes and ponds other than Cameron Springs
    - ♦ Supporting at least 3,000 angling trips at Cameron Springs
- Maintaining other consumptive programs such as fuelwood cutting and collection of materials at current levels.
- Providing optimum access consistent with military training by continuing the current Fort Riley policy of cohabitation with training.
- Maintaining a system for tracking all hunting and fishing permits with or without fees.
- Supporting, encouraging and educating the public about a "Watchable Wildlife" program and other non-consumptive forms of recreation such as hiking, bird watching, and nature photography.
- Continuing to provide education to the public about recreational opportunities on-post.

13.2. Military Mission Considerations

The military mission takes priority over all outdoor recreation. The primary mission of Fort Riley is to maintain combat readiness of its soldiers. Consequently, the military mission takes precedence over all announced hunting and fishing seasons. The installation or portions of it may be closed, without prior notice, for mission considerations. Fort Riley is not a public recreation area but is instead military training

installation that allows natural resources-based recreation only when it is compatible with the military mission. Security measures being implemented in 2001 will affect access for recreationists. Access restrictions may vary according to security threats as determined by the Department of Army or the installation.

13.3. Policy and Public Access

Fort Riley policy regarding public access, as stated in FR 210-15, is consistent with the Sikes Act, as amended by the Sikes Act Improvement Act of 1997 (P.L. 105-85), DoD Instruction 4715.3 (*Environmental Conservation Program 3 May, 1996)*, and Army Regulation 200-3, Chapter 7 (*Natural Resources-Land, Forest and Wildlife Management*). Section 2904 of the Sikes Act Improvement Act states that each INRMP shall provide, to the extent appropriate and applicable, for public access to military installations. DoD Instruction 4715.3 mandates that military lands, "shall be made available to the public for educational and recreational use of natural resources when such access is compatible with military mission activities..."{page 2, paragraph D(1)(d)}. Army Regulation 200-3, states that access for recreation, "will be within manageable quotas, subject to safety, military security, threatened and endangered species restrictions, and the capability of the natural resources to support such use..."(page 4, Chapter 2-10). Fort Riley Regulation 210-15 supports the policy established by the Sikes Act and mandates from higher headquarters.

Fort Riley currently allows the public, as well as soldiers and their dependents, to participate in natural resources-based recreation when compatible with the military mission and security. Fort Riley has had a policy since 1982 allowing certain forms of recreation to coexist with some types of military training. Access for recreation is precluded for safety or security reasons, or if a bona fide impairment of the military mission would occur, as determined by the Installation Commander.

13.3.1. Access Procedures

Access procedures have been developed to protect the military mission, soldiers, and recreationists. Procedures are being developed in 2001 to counter terrorist threats as determined by the DoD and DA. These procedures will include a variety of measures, that may include post closure if deemed warranted. Brochures are published and made widely available to recreationists describing access procedures for hunting, fishing, fuelwood cutting, and non-consumptive activities. These brochures explicitly state that the military mission and security take precedence over all outdoor recreation.

Natural resources-based outdoor recreational activities on Fort Riley take place only in areas authorized by the DES, Conservation Division. The authorized areas can change daily, depending on the schedule of the post's military trainers. Outdoor recreationists may call a 24-hour hotline, year around, for a tape-recorded listing of open areas. From 1 September through the end of February, open areas are posted at each of the nine self-service hunter check stations on post. Check station locations are shown on the Fort Riley Outdoor Recreation and Fuelwood Cutting Map, Section 7.2.1

Access to any area that is not listed as open for hunting, fishing, non-consumptive outdoor recreation, or fuelwood cutting is prohibited. The Impact Area (defined by and

enclosed within Old 82 Highway on the north, Mallon [Engineer] Road on the east, Vinton School Road on the south, and Trainfire Road [1st Division Road] on the west) and the Multipurpose Range Complex (MPRC) are off limits at all times.

All hunters, except firearms deer hunters, are required to physically register at a hunter check station each day they hunt. Hunters are required to complete a Daily Registration Form to ensure check-in is conducted and to collect harvest and other hunting information. Special check-in procedures are in effect for firearms deer hunters. All others using the post for recreation need not register each day but must check to ensure areas are open for the form of recreation in which they plan to engage.

13.3.2. Handicapped Access

Access to hunting and angling recreational opportunities by disabled persons is required to comply with the American with Disabilities Act and new provisions within the Sikes Act. Congress amended the Sikes Act to require military installations to ensure that disabled veterans and persons with disabilities have access to the same outdoor recreation opportunities as the public. This includes activities such as fishing, hunting, trapping, wildlife viewing, boating and camping on military lands.

Fort Riley currently supports access by disabled persons by waiving some installation regulations that are potentially impediments to recreation. FR 210-15 includes these four hunting regulations:

- A permanently disabled person who holds an approved special permit from the Secretary of the Kansas Department of Wildlife and Parks may hunt from a motor vehicle.

- A permanently disabled person who holds an approved special permit from the Secretary of the Kansas Department of Wildlife and Parks may hunt deer with a crossbow.

- The authorization to hunt from a vehicle does not permit any person to shoot from any improved road.

- All other state or Federal laws or regulations or Fort Riley regulations are enforced. Disabled persons may hunt from a motor vehicle only when in compliance with license and permit requirements, seasons, and bag limits, and other related laws and regulations.

13.4. Hunting, Fishing and Trapping

The Sikes Act (P.L. 86-797) and the Sikes Act Improvement Act of 1997 (P.L. 105-85) establishes policy for hunting, fishing, and trapping on military installations. The law covers access, issuance of hunting and fishing permits, and use of fees generated from the sales of installation hunting and fishing permits. Hunting and fishing should follow all applicable Federal and state laws and regulations and Fort Riley regulation 210-15.

All Kansas Department of Wildlife and Parks regulations for lawful hunting methods, equipment, bag limits, hunting hours, and season lengths are enforced on Fort Riley. All U.S. Fish and Wildlife Service laws and regulations for migratory bird hunting also are in force. All Kansas Department of Wildlife and Parks regulations for lawful fishing methods, equipment, creel limits, length limits, and season lengths are enforced on Fort Riley. Fort Riley's Hunting and Fishing Regulations (FR 210-15) are, in some aspects, more restrictive than state and Federal regulations and are in no case more liberal.

Executive Order (EO) 12962 (Recreational Fisheries, dated 7 June 1995), directs Federal agencies, to the extent permitted by law and where practical, to improve recreational fishing opportunities on their lands. Fort Riley implemented this Executive Order by diversifying the sport fisheries available and increasing the opportunity for and enhancing the quality of recreational fishing on post. Recreational fishing was primarily based on annual stocking of channel catfish as mostly a put-and-take program prior to 1995.

Fort Riley has constructed three new fishing ponds and renovated one degraded pond since the enactment of that EO in FY 95. The sport fishery program has diversified by establishing two new wiper populations, two new redear sunfish populations, two new flathead catfish populations and one new hybrid bluegill fishery. Bass fisheries have been increased from six to eleven. Two of the previous bass populations were considered poor but currently all populations offer quality fishing. Corrective stockings have been accomplished in two ponds and predator-prey imbalances corrected in two others. Two ponds are now managed for fathead minnows to provide a cost-free supply of prey.

Trapping of wildlife for sport and recreation is prohibited at Fort Riley because compliance with state regulations requires inspection of traps at least every 24 hours which is not possible at Fort Riley due to extensive training that may unpredictably preclude access to traps.

Youth development is a high profile aspect of hunting and fishing on Fort Riley. Children's Fishing Derbies are supported during annual Kids Fishing Day-Hooked on Fishing and the installation supports youth waterfowl hunting day (as established by the USFWS) and firearms deer and pheasant/quail hunting youth days. Fort Riley will cooperate with KDWP "Pass It On" program if requested by KDWP. Youth development includes youngsters on and off the installation.

13.4.1. Permits and Fee Structure

Licenses, permits and fees for hunting and fishing shall be required in accordance with applicable state and federal laws and military regulations in accordance to the Sikes Act. The possession of a Fort Riley permit entitles the permitee to hunt or fish in areas open to such recreation until the end of the current calendar year. The permit does not constitute a guarantee of access on any/or all days during the period for which it is issued.

Most types of permits such as fishing or small game hunting are allocated equally among user groups. Most permits are available to an unlimited number of permitees. However, when restricting the overall number of permitees is necessary to achieve natural resources

management objectives or maintain a safe installation, permits are distributed by impartial procedures, such as a first-come, first-serve basis or by a random drawing without regard to military affiliation.

One exception to this impartiality pertains to the issuance of Fort Riley Firearms Deer Tags by the installation (described in Section 8.6.2.2, *Big Game Harvest*). One-half of the annual number of these tags are allocated to the military, by Command Decision in 2001, to ensure maximum opportunity for this user group. The definition of "military" used in this INRMP is "Active duty, National Guard, Reserves, retired military, and Department of Defense civilians and their family members who are DoD identity card holders.

Another example of ensuring participation by Fort Riley soldiers, is KDWP's regulation pertaining to allocation of state elk hunting permits. As described in Section 8.2.2.2, permitees are drawn from a pool comprised of an equal number for Fort Riley military and non-military applicants.

The previous Cooperative Agreement among the installation, the USFWS, and the KDWP established the fee structure for hunting and fishing access. The fee structure could not be changed unilaterally by the installation without agreement from the other two parties. This INRMP supersedes the Cooperative Agreement. The fee structure is determined within these parameters:

- In accordance with AR 200-3, fees should be commensurate with program costs, state and local fees for similar activities and facilities, and resources available for use.

- Participation in hunting and fishing "will be within manageable quotas and within the capability of the natural resources to support such use" in accordance with AR 200-3.

- The sale of hunting and fishing access permits is an important source of funds to further hunting and fishing recreation.

- Fort Riley desires a quality hunting and fishing program that is cost effective as recommended by the Army Audit Agency.

- Use of funds must be accountable to the user groups. Funds are to be used only to further hunting and fishing recreation on-post.

Prior to 2000, "No Fee" installation hunting and fishing permits were only available to individuals under age 16 and more than 65. In response to the installation Commander's objective to increase the morale and welfare of soldiers stationed at Fort Riley, the fee structure was changed in 2000. At that time, the DA granted a conditional waiver that allowed issuance of "No Fee" hunting and fishing permits to junior enlisted personnel (E-4 and below). Both the USFWS and the KDWP concurred with that change.

The Special State Permit fee schedule, effective upon adoption of this INRMP is:

FISHING……..$ 9.00
(valid at all installation streams, lakes and ponds except Cameron Springs)
TROUT…….$ 9.00
(valid only at Cameron Springs)
HUNTING……$ 9.00
(valid for small game, waterfowl, pig and furbearer hunting)
COMBINATION…….$ 14.00
(valid for small game, waterfowl and furbearer hunting and fishing at all installation streams, lakes and ponds except Cameron Springs)
ARCHERY DEER……...$ 9.00
FIREARMS DEER……..$ 9.00
TURKEY…….$ 9.00
ELK…….$ 9.00
CONSERVATION……..$ 24.00
(valid for small game, waterfowl, furbearer, pig and deer hunting and fishing at all installation streams, lakes and ponds)
1 Free for those persons less than 16 years old and those 65 years old or older and to junior enlisted soldiers stationed at Fort Riley E1 – E4.

2 Free for those persons holding a valid Fort Riley Conservation Permit.

An administrative fee of $1.00 will be charged by the installation's Special State Permit vendor (Directorate of Community Activities). The administrative fee will not be charged to those individuals issued permits free-of-charge and it will not be included in the cost of the permit. As directed by Army regulations all Special State Permit fees collected will be deposited directly into the installation's Fish and Wildlife Receiving Account (21R5095)

Hunting and fishing permits sales at Fort Riley have steadily declined over the past 10 years and are projected to continue that trend. The number of hunting and fishing fee permits sold annually averaged 3,689 from FY91 to FY95. During FY95, many active duty military and their families were stationed at Fort Riley due to soldiers being moved from Germany as part of Army restructuring. After FY95, the average annual sales dropped to below 3,000 due to 1st Infantry Division downsizing and moving to Germany. Sales have steadily to decline since FY95. These trends are shown in Table 13.1 below.

Another factor in declining sales has been a recent change in the training schedule for deployment to the National Training Center. This train-up has occurred during the peak of upland game bird season and closed most and sometimes all of the installation to hunting during that time. Consequently, many general public hunters quit coming to Fort Riley.

An objective of this INRMP is to track the entire hunting and angling customer base, including "No-Fee" user group. An understanding of the entire customer base requires tracking of this large user group. Also, the DA waiver of installation hunting and fishing

fees was contingent upon monitoring elements of the Fish and Wildlife Account, including demographics.

Table 13.1 HUNTING AND FISHING PERMIT SALES

Fiscal Year	# Fee Permits	# NC Permits	Total	% Change**
FY00	1907	Not Available	1907	-14
FY99	2313	Not Available	2313	-15
FY98	2716	Not Available	2,716	-7
FY97	2921	Not Available	2,921	< 1
FY96	3082	616	3,698	-20
FY95	3866	658	4,524	-5
FY94	4063	674	4,737	29
FY93	3145	718	3,863	-20
FY92	3934	833	4,767	14
FY91	3437	693	4,130	baseline

* totals after FY96 do not include "No Fee" permits
**change in fee permits

Table 13.2, on the next page, shows the breakdown of permits issued between FY93 and FY99. Some insights into hunting and angling recreation on post can be gleaned from this table. In FY96, fee hunting permits accounted for 52% and fee fishing permits account for 24% of the permits sold. Conservation permits allowing all types of hunting and fishing, including big game hunting and trout fishing, are relatively popular and account for 16% of the permits sold. The number of Conservation permits sold has increased through the years. All Conservation permits were fee permits and, thus, were not sensitive to lack of tracking. The Combination hunting and fishing permit excludes big game hunting and trout fishing. This permit is relatively unpopular, having traditionally low sales.

An important trend is the drastic and consistent decline in the sales of trout permits. Sales of these permits are no longer generating enough income to support the program perhaps because recreationists are shifting toward the all encompassing Conservation Permit, which is increasing in sales. Regardless, other permit sales subsidize the trout fishery.

Table 13.2. NUMBER AND TYPE OF PERMITS ISSUED

FY	HUNT	FISH	COMBO	CONSER	TROUT
00**	888	692	28	459	175
99**	1092	759	39	406	155
98**	1417	671	51	431	168
97**	1583	762	53	361	186
96*	1721	1553	106	313	279
95*	2148	1930	113	323	337
94*	2226	1975	119	349	457
93*	1679	1677	117	336	491

*includes fee and no fee permits
** includes fee permits only

13.4.2. Levels of Participation and Demographics

The number of hunting trips taken on Fort Riley steadily increased from 1982, peaking during the 1995–1996 hunting season. During that year, approximately 7,500 hunting trips were reported. The number of annual hunting trips taken on Fort Riley has declined since then which has been attributed in great part to installation down-sizing and recent large-scale training exercises during the peak of upland game season that precluded hunting throughout much, if not all, of the installation. The relatively small fall population of the bobwhite quail, a popular quarry, may have reduced hunting trips in recent years. The number of annual trips has averaged approximately 5,400 during the last five years. Table 13.3 shows the number of hunting trips taken annually between 1993 and 2000.

Table 13.3 ANNUAL HUNTING TRIPS

YEAR	1993/1994	1994/1995	1995/1996	1996/1997	1997/1998	1998/1999	1999/2000
# TRIPS	6,178	7,182	7,502	6,427	4,358	4,810	4,100

The most popular form of hunting on Fort Riley is upland game bird hunting, which totals about 50% of reported hunting days. Firearms deer hunting accounts for about 27% of annual hunting trips. Other forms of hunting account for about 23% of trips annually.

Fishing on Fort Riley is much more sensitive to the number of active duty military and families stationed on Fort Riley than is hunting. Downsizing of active duty military by about one-third on post has a substantially reduced fishing because of the loss of family members who fish frequently. Conversely, it is less sensitive to training restrictions because angling can coexist with many forms of military training, and many fishing lakes (particularly high use lakes near housing) and ponds are in areas seldom affected by training restrictions.

Creel surveys conducted in the late 1980s indicated that more than 35,000 fishing trips were taken on Fort Riley. In 1989, 13,000 and 10,000 trips were taken to Moon and Funston lakes, respectively. The 1998 creel survey was designed differently from the previous surveys and did not yield total numbers of fishing trips taken. However, extrapolations of data suggest that fishing declined drastically. At three selected waters (Funston, Breakneck, and Moon lakes), the 1998 creel survey suggested that the number of anglers has decreased by 55% overall. Fishing at Cameron Springs also has declined substantially.

Demographic information obtained from permits and creel surveys indicate that active duty military personnel and their dependents compose most of the anglers on post. About 70% of fishing trips are taken by military personnel and their dependents. As indicated by the number of “no fee” fishing permits issued prior to 1997, dependents of active duty military are a very significant proportion of anglers on post. This indicates the high value of fishing recreation to families.

Hunting has a much larger proportion of participants from the public. Typically, about 40% of hunting trips are taken by the military and their dependents and 45% are taken by the general public. Trips taken by Department of Army civilians and retired military

comprise 10-15% of the total. Although the proportion is unmeasured, a substantial number of the trips taken by the public are taken by out-of-state hunters.

13.5. Other Natural Resources Related Outdoor Recreation

Fort Riley supports multiple-use outdoor recreation that includes consumptive and non-consumptive uses. Other consumptive uses, besides hunting and angling, are fuelwood-cutting and wildflower and mushroom (morel) gathering. Non-consumptive pursuits include hiking, photography, bird watching, and mountain biking. There are no data available indicating how many non-consumptive trips are taken annually. However, based on anecdotal evidence, these pursuits are substantial. Military personnel, their families, civilian employees, and the public participate in these pursuits.

13.6. Recreation and Ecosystem Management

The preservation and enhancement of ecosystem integrity supports human use of natural resources. A healthy ecosystem sustains more recreation and possesses greater quality than an ecosystem with compromised integrity. A healthy Fort Riley ecosystem can support more hunting and angling trips that provide a high measure of satisfaction to the recreationists. For example, the reintroduction of elk to Fort Riley was originally undertaken to restore native biodiversity. As a secondary result, Fort Riley and surrounding private lands are the only place in Kansas with a huntable herd of elk (as of 2001).

Ecosystem integrity supports Quality of Life goals. Soldiers, their families and the general public have the opportunity to engage in a wide variety of hunting and angling experiences. Again, the elk provide a huntable resource for soldiers.

A holistic approach also recognizes non-consumptive recreation such as wildlife watching and hiking. These forms of recreation also benefit from ecosystem integrity. Woodlands along the Fort Riley riverine system provides bird-watchers with the opportunity to view a variety of woodland birds not commonly viewed within the Flint Hills ecosystem.

13.7. Safety and Security

Safety is the paramount consideration in managing recreational access. The safety of recreationists and soldiers must be taken into account, particularly during hunting season. However, preventing conflicts between training and hunters, anglers, and other recreationists is important as well.

Fort Riley's safety record for natural resources-related recreation is excellent, particularly for hunting. Only two reported hunting accidents have occurred on Fort Riley since 1988 despite more than 6,000 hunting trips taken annually. Both of these occurred during upland game bird hunting as a result of hunters "swinging through" a flushed bird, firing, and hitting another hunter. Neither accident was fatal or resulted in severe injury. No drownings have occurred on Fort Riley lakes and ponds. No recreationists have been injured during training activities.

New security measures to counter terrorism were mandated by DoD in 2001. As of 2001, security policy and procedures are in the process of development. These measures will restrict access to some or all of the post without prior notification based on threat levels.

13.7.1. Access Restrictions

The primary mechanism for ensuring safety of recreationists is access restriction pertaining to the military mission and security. The access procedures described in Section 13.3.1 protect soldiers and the recreationists and minimize interference with the military mission. Access is prohibited to any area not listed as open for recreation. Live-fire training, aerial artillery, and demolition are the main types of training that preclude access. Shotgun hunting (using shot smaller than number 4), archery hunting, angling, fuelwood cutting, and non-consumptive recreation can coexist with maneuver training unless the training presents a safety or security risk.

Rifle hunting is restricted to those areas that are not scheduled for training on that particular day. Access for firearms deer hunting generally is not an issue because this season is established concurrent with the Thanksgiving and Christmas training holidays. During those training holidays, the installation is, generally, fully accessible.

Safety requires that hunting access be limited because of hunter density as well as military training. Access permission during the spring turkey season is limited to sixty hunters, who must remain in designated areas. Firearms deer hunting is limited to those possessing either a KDWP issued Unit 8 or Unit 9 permit and the Fort Riley Firearms Deer Tag . These hunters are assigned to one of six hunting areas, and hunters must remain in their assigned area to prevent overcrowding and to distribute hunter density.

One of the access issues pertaining to hunter density is firearms elk hunting. The KDWP has substantially increased the number of firearms elk permits. Fort Riley would not be able to accommodate all hunters on any given day due to military training. Thus, a system was established in 1999, in collaboration with the KDWP, to more evenly distribute hunting pressure by dividing the season into four segments with only a limited number of permits issued for each segment. However, a substantial number of hunters can be supported during the entire season, combining the segments.

Effective law enforcement is another primary means for ensuring safety of recreationists. Enforcement of access restrictions and safety checks of firearms and boats contributes toward making opportunities to recreate safer.

13.7.2. Fort Riley Regulations

Fort Riley has imposed additional hunter safety regulations. An example is the hunter orange requirement for all upland game hunters (except for specific forms). This requirement makes hunters more visible to one another and to soldiers in the field. Another regulation is the prohibition against discharging firearms or bow within 328 feet of an improved road or tank trail. Other safety regulations are listed in FR 210-15, *Installation Hunting and Fishing Regulations* (1994) .

Rifle hunting and shotgun hunting using #4 shot or larger is restricted to those areas that do not have soldiers training in them. Human population density and the number of improved facilities require that all parts of the installation south of Vinton School Road be closed to rifle hunting. Exceptions to this restriction concern the use of .22 rimfire rifles loaded with "short" cartridges to take treed raccoons and the use of muzzleloaders (black powder rifles) to take deer. The portion of the installation south of Vinton School Road is open only to shotgun and archery hunting outside of the firearms deer season. The Impact Area and the Douthit Range Complex are off-limits to all recreational use.

13.7.3. Hunter Education

State regulations require all individuals born on or after 1 July 1957 to complete a Hunter Education Course prior to purchasing any Kansas Hunting License.

Fort Riley's Safety Office was responsible for Hunter Education instruction on Fort Riley from 1972 through 1983. Volunteers as part of the state-wide program began teaching Hunter Education after 1983 and continue to do so. Courses are offered occasionally throughout the year, particularly during the fall. Outdoor Recreation takes registration for all Hunter Education Courses on Fort Riley. Approximately 200 - 250 individuals received Hunter Education certification each year through on-post classes.

Bowhunter education courses are required for individuals who bow hunt and were born on or after 1963. There are no plans for volunteers to begin teaching bowhunter education on post. However, this may occur if a group of volunteers decides to teach.

AR 210-21 requires all personnel, regardless of age, to complete a certified Hunter Education course or equivalent prior to hunting on Army lands. In 2000, Fort Riley implemented policy to conform to this regulation.

13.7.4. Recreational Off-Road Vehicles

Recreational Off-Road Vehicle (ORV) use is strictly regulated by AR 200-3, *Fort Riley Range and Training Safety Regulation* FR 385-12 (1998), and FR 210-15. AR 200-3 devotes an entire chapter to ORV's and mandates that the environment be considered when allowing ORV use. Vehicles may use any improved road, gravel road, or existing trail but may not travel off-road. This prohibition is a critical safety regulation because unseen off-road hazards related to military training (hasty fighting positions, concertina wire, etc.) are present on the installation. This regulation is not waived for handicap accessibility.

14.0 CULTURAL RESOURCES PROTECTION

All types of cultural resources are present within the boundaries of Fort Riley. These include a) a National Register Historic District; b) historic and prehistoric archaeological sites; c) historic landscapes, structures, and objects; d) historic trails; and e) traditional cultural properties of interest to Native Americans and other distinct cultural

communities. Fort Riley's mission and mission support activities, such as the Natural Resources Program, have varying degrees of impact on these cultural resources.

Adverse impacts from natural resources management activities on cultural resources are minimized to the greatest extent possible by the integration of cultural resources management and natural resources management within the DES, Conservation Division.

Cultural resources protection at Fort Riley is primarily provided in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended by (NHPA)(16 U.S.C. 470), the Archaeological Resources Protection Act (ARPA)(16 U.S.C. 470aa-mm), the American Indian Religious Freedom Act (AIRFA)(42 U.S.C., 1996), the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) (25 U.S.C. 3001-3013), AR 200-4 *Cultural Resources Management* (October, 1998), and other pertinent Federal laws, regulations, and executive orders. Fort Riley also has implemented an Integrated Cultural Resources Management Plan (ICRMP), a Programmatic Agreement with the State Historic Preservation Office (SHPO), the Advisory Council on Historic Preservation (ACHP), and Comprehensive Agreements for the implementation of NAGPRA with the Kaw Nation of Oklahoma (also called the Kansa Tribe) and the Pawnee Tribe.

14.1. Objectives

The ICRMP has the following objectives:

- To implement this plan consistent with protection of cultural and historic resources at Fort Riley.

- To integrate the actions in it to the greatest extent possible, with actions to protect cultural resources to achieve program efficiencies in funds and manpower.

14.2. Cultural and Historic Resources

There are 101,656 acres of land within the boundaries of Fort Riley. Of those, 5,613 acres are in cantonment areas, which include improved or semi-improved grounds. The remaining acreage is primarily devoted to military training, including 16,200 acres of impact zone and 30,500 acres in live-fire danger zones. Of the approximately 56,000 acres remaining, about 50% have been surveyed for archaeological sites. To date, 927 sites have been located, of which 216 are prehistoric, 565 are historic civilian sites, and 118 are historic military sites. The remainder are isolated finds. Artifacts have been found representing human occupation during all the prehistoric and historic periods in Kansas.

14.2.1. Prehistoric Resources

14.2.1.1. Paleoindian Period (ca. 10,000–6000 BC*)*

Although the Paleoindian period is represented on Fort Riley by only one isolated find, the geomorphological and geoarcheological investigations that have been conducted on

the installation indicate the potential for future discoveries of Paleoindian sites. Most of such sites are likely to be deeply buried under alluvium at a depth of 11.5-16.4 feet.

14.2.1.2. Archaic Period (6000 BC–A.D 1)

During the geomorphological and geoarcheological investigations at Fort Riley, indications of Archaic period human activities were found at depths ranging from 8.2-11.5 feet. Some isolated Archaic period lithics have been found on the installation.

14.2.1.3. Ceramic Period

Early Ceramic Subperiod (AD 1–900). The most obvious manifestations of the Early Ceramic subperiod on the installation are the nine burial mounds distributed on the uplands above the local rivers and creeks. Pottery and lithics were recovered from a multicomponent site as well. Early Ceramic settlement patterns uncovered elsewhere in Riley County indicate that they cluster around the confluences of creeks and rivers. The sites are most often encountered at depths of 3.3-4.9 feet.

Middle Ceramic Subperiod (AD 900–1250). Most culturally identifiable prehistoric sites on Fort Riley fall into the Smoky Hill phase of the late Middle Ceramic subperiod. These sites are generally found along the major creek drainages on the installation and often have artifact scatters visible on the ground surface.

Late Ceramic Subperiod (AD 1450–ca. 1870s?). Although no Late Ceramic subperiod sites have been located on the installation, local collectors and ethnohistoric oral traditions attest to the presence of camps of transient Native Americans in the area. Other support for the potential existence of such sites comes from journals and maps of eighteenth-century French explorers who recorded Kansa Indian villages along the Kansas and Republican rivers; one apparently on land now occupied by Fort Riley.

14.2.2. Historic Resources

Historic period archaeological sites are divided into two major categories. *Civilian sites* are largely in the areas of the 1942 and 1966-1967 installation expansion land purchases. They are related to the historic occupations of these areas between the early 1850s and purchase by the U.S. Army. *Military sites* are largely within the limits of the original 20,000-acre Fort Riley reservation and are related to use of the installation to maintain garrisons and train soldiers from 1853 to World War II (1945).

14.2.2.1. Civilian Sites

Civilian historic period sites contain several types of archaeological sites that are defined by site function. The largest category consists of farmsteads. Others include country homes, schools, churches, cemeteries, and structures associated with roads having bridges, culverts, and embankments. There are some completely unique sites as well, such as the First Territorial Capitol of Kansas and Army City, a WWI “payday” town.

14.2.2.2. Military Sites

Military sites include sites that are completely archaeological (i.e., lacking standing structures) and the far larger category of sites defined as the archaeological component or components of a standing building or buildings. Such sites include The Main Post, the center of Fort Riley from 1853 to present; outlying sites, associated with the U.S. Cavalry School (e.g., the Packer's Camp, World War I, and World War II, major training camps, especially Camp Funston, Camp Forsyth, and Camp Whitside; training ranges, such as the Old National Rifle Range; and Marshall Army Airfield. The area of Camp Whitside may also contain archaeological remnants of the Army Maneuvers Camp of 1902; geographical contiguity allows us to consider these possible remains as part of the Camp Whitside site. The Main Post Cantonment, portions of Marshall Army Airfield, and Packer's Camp have also been listed as National Register Historic Districts.

14.3. Natural Resources Management Implications

Since the development of a Cultural Resources Management Program at Fort Riley, Natural Resources Management and Cultural Resources Management policy have been integrated in fact, if not in a fully developed plan. Fort Riley recognizes that cultural resources, like some natural resources, are non-renewable and must be treated under the Public Trust Doctrine, which recognizes the importance of stewardship and preservation of resources on public lands.

As a result of the close partnership between the Cultural Resources and Natural Resources managers, principal Natural Resources activities were included in the Programmatic Agreement between Fort Riley and the SHPO and ACHP. These activities include the following:

- timber harvests, tree planting and maintenance of wildlife food and shrub plots in previously disturbed areas, prescribed burning of rangeland, and the improvement of existing stream crossings.

- removing of animals, birds, insects, and their associated debris from buildings and structures when no loss of historic materials will result.

- existing hay and hayseed harvest activities or planting, cultivation, and harvest of existing crops not exceeding the depth of existing activities.

- removing and replacing plant materials when they pose an imminent hazard to personnel or structures.

- all ground disturbance reviewed through the Kansas ONE CALL and Fort Riley DIGSAFE programs.

- all tactical excavations reviewed through the Tactical Excavations Permit program.

- any observed or reported inadvertent, but not extensive, damage to subsurface historic properties as a result of training and/or maneuver.

All of the above are documented and included in an annual report to the SHPO and ACHP.

LRAM projects are coordinated with Cultural Resources managers through the Fort Riley GIS database and by coordinated planning meetings. ITAM also includes cultural and natural resources information in its Senior Non-Commissioned Officers Refresher Course and in their Soldier and Leader cards and handbooks.

Other natural resources management activities that might impact cultural resources are coordinated within the DES, Conservation Division through weekly staff meetings, briefings, and planning sessions.

15.0 NATIONAL ENVIRONMENTAL POLICY ACT

The National Environmental Policy Act (NEPA) of 1969, as amended (Public Law 91-190, 42 U.S.C. 4321 et. seq.) and implemented by the Council on Environmental Quality (CEQ) regulations (40 CFR 1500 et. seq.), was created to prevent or eliminate negative environmental effects from Federal projects and activities. Any action that could have an impact on human health, any natural system (air, water, soil, plant, animal, or other resources) and any social or economic system (to include Environmental Justice), upon which there is an expenditure of Federal funds, must have some level of environmental analysis to determine the effects.

15.1. Objectives

Ft. Riley has adopted the following plan of action to ascertain the environmental consequences of its projects and activities.

- Identify projects and activities on Fort Riley that might impact natural resources and work with decision makers early in the planning process to resolve issues using NEPA.

- Use NEPA to ensure this plan is considered according to the letter and spirit of NEPA.

- Maintain NEPA compliance at Fort Riley including consideration of the effects of implementation of the installation's Master Plan.

- Promote visibility of NEPA requirements through maintenance of a NEPA webpage on the Fort Riley Intranet.

15.2. Responsibilities

The proponent (an individual or group that proposes a task that must be reviewed under NEPA) is responsible for notifying the NEPA Program Manager and funding NEPA documentation, if applicable. According to AR 200-2, decision makers will be cognizant of, and responsible for, the impact of their decisions on cultural resources, natural resources, and the human environment.

Once the NEPA Program Manager is contacted, the Manager is responsible for evaluating the proposed action to determine the appropriate level of NEPA documentation to be used.

15.3. NEPA and Natural Resources Management

Natural resources activities must be properly planned, coordinated, and documented using NEPA. All natural resources management activities are considered and implemented according to the requirements of NEPA. An Environmental Assessment will, for example, be completed for this plan following its approval by the U. S. Fish and Wildlife Service, Kansas Department of Wildlife and Parks, and Fort Riley's Commanding General and prior to implementation of it. It will only be implemented if that Environmental Assessment generates a Finding of No Significant Impact (FNSI). During implementation of this plan, Records of Environmental Consideration (RECs) will be prepared and maintained on file for actions that are directed by the plan but that are not specifically described in the plan prior to their accomplishment. The NEPA process is also used to identify potential impacts on natural resources from other installation activities and projects.

The installation will take the following steps to use NEPA to ensure the health and welfare of humans as well as protect and conserve Fort Riley's natural and cultural resources:

- Involve the NEPA Program Manager in the planning process of proposed actions as soon as possible.

- If an action may impact the environment, ensure mitigation measures are included in the NEPA document, if applicable. Ensure that mitigation is considered in funding.

- Use natural resource capabilities to provide mitigation. These resources include improved grounds, range, fish and wildlife, and forestry management.

- Track projects for mitigation, restrictions, and special considerations.

- Ensure that NEPA documentation was prepared for actions requiring NEPA.

- Use the lowest level of appropriate NEPA documentation to minimize paperwork.

16.0 BIOPOLITICAL ISSUES

Human dimensions are inherent in natural resources management. Two of the three primary goals of this INRMP are human related: military readiness and quality of life. Additionally, management decisions or emphasis on natural resources objectives can create biopolitical issues.

Another type of issue concerns the relationships, cooperation, and collaboration among various installation activities. There are many internal stakeholders in natural resources management on Fort Riley. These issues concern the allocation of responsibility for the many natural resources programs and recreational programs among various installation activities. Secondly, various internal activities have their own priorities and mechanisms for conducting their particular operations. Consequently, issues arise out of organizational differences among activities. Biopolitical issues can be external, as well as internal, to the installation. Issues can arise between the installation and neighboring communities. Also, issues may relate directly to relationships between the installation and special interest groups or organizations.

16.1. Identification of Issues

Biopolitical issues can be divided among natural resources management, installation operations, or recreational operations. Natural resources management issues relate to the establishment of specific objectives such as prescribed burning, haying, and timber management. Installation operation issues primarily relate to actions affecting threatened and endangered species and coordination issues. Recreational issues include Sikes Act permit fees, issuance of installation hunting and fishing permits, and access issues.

16.1.1. Natural Resources Management

Issues for natural resources management include the following:

- The need to integrate Neotropical Migratory Bird Management into Forestry and Range Management.
- The requirement to reduce pesticides used on Fort Riley by 50% from the amount used in 1993.
- The application of prescribed burning relative to woodlands.
- Wildlife-human interaction within housing areas.
- The impact on the military mission of the Federal listing of the Topeka shiner.
- The development of a system to consistently and accurately monitor soil erosion into streams.
- The control of exotic organisms, particularly sericea lespedeza and feral swine.

16.1.2. Installation Operations

Issues pertaining to installation operation include the following:

- The need for consistent collaboration between the installation's Environmental Directorate (Directorate of Environment and Safety) and other installation activities requiring review of impact on natural resources, particularly relating to threatened and endangered species.

- The importance of effective communication between natural resources managers and Command Level decision-makers.

16.1.3. Recreational Operations

Issues pertaining to recreational operations include the following:

- The waiver of installation hunting and fishing permit fees for soldiers.

- Ensuring noninterference with the military mission by hunters, anglers, and other recreationists.

- Ensuring security and implementation of evolving security measures.

- Conservation law enforcement.

- Accessibility issues for disabled persons.

- Native American issues.

- Ensuring current, high-level community outreach and education within a work environment of greater responsibility concurrent with cutbacks of civilian workforce.

16.2. Environmental Justice

President Clinton issued Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*, on 11 February 1994. This Executive Order intends to avoid the disproportionate placement of adverse environmental, economic, social or health impacts from Federal actions and policies on minority and low-income populations or communities.

There are no disproportionate adverse environmental impacts to minority or low-income populations as a result of natural resources management on Fort Riley. The recreational benefits and quality of life aspects associated with natural resources management enrich the quality of life for Kansas citizens and military personnel alike. Many of these individuals are from urban backgrounds and thus perceive these benefits as unique and special experiences. Fort Riley hunting and fishing permits are among the lowest in cost among FORSCOM installations. Their minimal cost is not prohibitively expensive for low-income individuals. Further, all non-consumptive recreation is available at no cost.

16.3. Resolution Mechanisms

Resolution of biopolitical issues is achieved through various mechanisms and processes. These include negotiation, compromise, education and communication, upper level decision-making, and adherence to compliance requirements. The first three mechanisms listed require personal skills, a sense of integration of mission and objectives, as well as a desire to be good-faith partners.

At times, issue resolution requires top-driven measures. Upper-level decision-making may be required to resolve a deadlock or cement a policy into place. One of the most powerful modes of decision-making is the CG Policy letter or the CG's signature on a planning document. Legal compliance requirements take precedence over all other mechanisms in resolving biopolitical issues. A second echelon in compliance is adherence to DoD and Army regulations, instructions, and directives.

Strategic planning is a means of resolving issues before they become major challenges. The planning process provides a look-ahead for managers and to other activities. This INRMP is the means for implementing an integrated approach to natural resources management. Also, annual and overall management plans are developed to guide efforts in the short term.

16.4. Resolved Issues

The mechanism and processes described above have been successfully implemented in several instances. The most recent success is the fielding in 1998 of the M-56/M-58 Smoke Generator used to produce obscurants during combat. The planning process and extensive cooperation and collaboration between the DES, Conservation Division, the G3/DPTM, and the 172nd Chemical Company resulted in Fort Riley being the first Army installation to field this new equipment. Other examples of resolved issues follow:

- Development, CG approval, and implementation of Endangered Species Management Plans to ensure compatibility of the mission with compliance requirements.

- Implementation of an effective "Tactical Dig Request" tracking and approval system.

- Effective integration of applicable natural resources programs with the ITAM program.

- Decision by USFWS not to pursue Federal listing the Henslow's sparrow under the Endangered Species Act based on extensive data gathering and surveys indicating this species has a robust population on Fort Riley.

17.0 IMPLEMENTATION

This section describes the organization, manpower, and budget requirements necessary to implement this INRMP. It discusses the relationships among internal activities that are

required and their roles and responsibilities. A section pertaining to Cantonment Areas (Improved Grounds) is included although all responsibility, funding, and personnel lie within the DPW. ITAM is discussed also, although all responsibility, funding, and personnel lie within G3/DPTM.

Outdoor recreation personnel are not discussed because their duties do not directly include natural resource management and their budgets are outside of the scope of this INRMP. Cultural resources and NEPA are structured under the Conservation Division. However, these programs provide different forms of environmental management than natural resources. Thus, they are not discussed.

17.1. Organization, Roles, and Responsibilities

The DES, Conservation Division is the principal implementing agent of this INRMP and associated annual plans. The Conservation Division coordinates with the other operations responsible for implementing specific portions of the plan to ensure an orderly and coordinated implementation.

The DES and the G3/DPTM are the Fort Riley operations responsible for management of natural resources at Fort Riley. Forest, range, fish and wildlife management; protection of the environment from pollutants; and clean-up of polluted areas are the specific responsibility of the DES. The G3/DPTM is responsible for planning and implementing the installation's ITAM program. The Conservation Division coordinates with the Range Branch of the G3/DPTM to make available areas for a variety of management and recreational activities as well as to accomplish the installation's ITAM work plans.

The Morale, Welfare, and Recreation Division of the Directorate of Community Activities (DCA) issues the post's fuelwood and hunting, and fishing permits through the Outdoor Recreation Branch. Outdoor Recreation Branch, in cooperation with the DES, Conservation Division, is responsible for establishing, planning, and coordinating all recreation aspects of hunting and fishing at Fort Riley.

The Fire and Emergency Services Division of the Directorate of Public Works (DPW) is responsible for controlling wildfires. The DPW provides manpower and equipment to conduct prescribed burns according to plans developed collaboratively by the DES, the G3/DPTM, and the DPW. DPW also assists DES, Conservation Division by accomplishing earth-moving tasks such as construction of berms for wetlands.

The Provost Marshal's Office (PMO) is responsible for enforcing hunting and fishing regulations on Fort Riley including the fish and game laws of Kansas and the U.S. Government. PMO personnel performing game warden duties receive instruction on fish and game and fuelwood permit enforcement from the DES, Conservation Division. Responsibility for oversight of a new civilian conservation officer is shared between the PMO and the DES.

The Veterinary Activity, a subactivity of the Medical Activity (MEDDAC), is responsible for the prevention and control of communicable diseases of wildlife on Fort Riley in

cooperation with the DES, Conservation Division. By collecting blood and tissue samples from various wildlife species, the Veterinary Activity monitors parasite and disease occurrence. Zoonotic diseases, pests, and wildlife borne diseases are monitored cooperatively between the MEDDAC's Preventive Medicine Service and the DES, Conservation Division.

17.2. Manpower

A mix of professional and non-professional series government employees, contractors, military personnel (military police), and student participants currently implement the activities related to this INRMP. Fort Riley is currently completing a "Commercial Activities Study" of its DES with results expected to be announced mid-2001. This study may affect the mix of employee-types from that Directorate involved in implementing this plan. Regardless, the current organizational structure of the installation, under which professional series government employees direct and oversee the implementation, of this plan will be maintained.

Ongoing training of personnel involved in the implementation of this plan will continue to be undertaken. That training is provided by various professional societies (e.g., The Wildlife Society, Society for Range Management, American Fisheries Society, Society of American Foresters, the Kansas Arborist's Association, and the National Military Fish and Wildlife Association (NMFWA)). Subject to budget and manpower constraints, at least one member of the installation's staff implementing this plan will attend each of the following annual workshops, training sessions, or professional conferences:

- NMFWA annual training sessions.
- North American Wildlife and Natural Resources Conference.
- Society of American Foresters annual national and regional conferences.
- The Wildlife Society state, regional, and national conferences.
- The Kansas Arborists' Association Conference.
- The Army ITAM Conference.
- The North American Weed Management Conference.
- The DoD Triennial Pest Management Conference.

Other conferences and workshops may be included depending on availability of funds and their direct applicability to specific projects and program priorities. An example would be continued participation in Partners in Flight.

Priority will be given to training required to maintain certifications, such as certification for DoD pesticide applicator and Federal Wildland Firefighter ("Red Card"). Technical training in the GIS, prescribed burning, wetlands management, forest management and

ecology, pest management, and other skills-enhancement programs directly applicable to fundamental resources management are the types of training that will be given secondary priority in funding. Tertiary priority will be given to training personnel in related environmental fields such as NEPA training or other career development types of training.

17.3. Program Priorities

Preparation and implementation of this INRMP is required by the Sikes Act and Army Regulations and thus must be funded according to DoD Instruction 4715.3, OMB Circular A – 106 rules and Department of Army Policy. This document is a Federal Facilities Compliance Agreement for which a NEPA document has been completed prior to its final approval.

Funding is not unlimited, however, and projects and programs described in this Plan must be prioritized. The sections below list those programs and projects in order of priority. These priorities reflect funding requests through the Environmental Program Requirements (EPR) system of the Army in FY01 and beyond, other installation Operation, Management and Administration (OMA) supported actions, and projects implemented with program specific funds (Ag/grazing, Forestry, and Hunting and Fishing Permit Fee funds). The priorities below are discussed in more detail in their respective INRMP sections. Appendix F contains copies of all EPR's showing funding requests through the life of this INRMP.

17.3.1. High Priority Programs and Projects

These programs and priorities include Environmental Program Requirements (EPR) class 0 and 1. A comprehensive list of high-priority programs and activities follows:

- *Program Administration*
  - ♦ Personnel salaries (government and contractor)
  - ♦ Maintenance of law enforcement support
  - ♦ Natural resources management supplies and equipment
  - ♦ Provision of required training
  - ♦ Provisions for NEPA compliance (as a subset of project costs)
- *Ecosystem Monitoring*
  - ♦ Conduct of planning level surveys
  - ♦ Implementation of LCTA component of ITAM
- *Fish and Wildlife Management*
  - ♦ Management of animal damage control
  - ♦ Continuance and expansion of conservation partnerships
  - ♦ Development and management of wetlands

- ♦ Management of hunter and angler access
- ♦ Harvest
- ♦ Collection and analysis of harvest data
- ♦ Enhancement of recreational fisheries
- ♦ Implementation if habitat prescriptions

- *Threatened and Endangered Species Management*
  - ♦ Implementation of ESMPs
- *Range Management*
  - ♦ Implementation of LRAM component of ITAM
  - ♦ Conduction of prescribed burning
  - ♦ Maintenance of agriculture leases
- *Forest Management*
  - ♦ Implementation of forest management plan
  - ♦ Preparation and implementation of forest stand management plan
  - ♦ Planting and maintaining forest plantings
  - ♦ Performance of timber stand improvement
  - ♦ Preparation and implementation of timber sales
  - ♦ Performance of forest pest surveillance and control
- *Pest Management*
  - ♦ Updating and implementation of integrated pest management plan

17.3.2. Important Programs and Projects

What follows is a comprehensive list of important programs and activities (including EPR Class 2H):

- *Program Administration*
  - ♦ Updating GIS
  - ♦ Continuing conservation education and awareness
  - ♦ Providing routine computer upgrades
  - ♦ Support of youth and community outreach activities
- *Ecosystem Monitoring*
  - ♦ Obtaining updated aerial photography
  - ♦ Updating the herbarium

- ♦ Conducting breeding bird surveys
- ♦ Conducting surveys of calling amphibians
- ♦ Updating forest ecosystem inventory
- ♦ Conducting exotic organism survey
- ♦ Conducting study of fire effects on forest ecotone
- ♦ Conducting upland game bird surveys
- ♦ Conducting aerial elk surveys

- *Fish and Wildlife Management*
  - ♦ Enhancing watchable wildlife programs
  - ♦ Conducting creel census
  - ♦ Renovating existing, degraded ponds
- *Threatened and Endangered Species*
  - ♦ Conduct Henslow's Sparrow Surveys
  - ♦ Conduct Surveillance for and Monitoring of Species in Need of Conservation
- *Range Management*
  - ♦ Conducting tree and brush removal in rangeland areas
- *Forest Management*
  - ♦ Develop forest stand management plan for bald eagle habitat
  - ♦ Support of engineering unit training for felling and bucking
  - ♦ Constructing firebreaks to protect woodlands
  - ♦ Planning and Constructing forest access trails
  - ♦ Maintaining forest reclamation plantings
  - ♦ Operating fuelwood program
  - ♦ Providing urban forestry management
- *Pest Management*
  - ♦ Participation with USDA-APHIS-PPQ on "Bio-Control Board"
  - ♦ Development of alternative control methods for pests
  - ♦ Provision of weed control for targetry and ranges

17.4.3 Tertiary Programs and Projects (including EPR Class 2M, 2L, and 3)

A lower level of priority will be given to the programs and activities listed below.

- *Program Administration*

- ♦ Expanding school outreach programs to include off-post schools

- *Ecosystem Monitoring*
  - ♦ Conducting neotropical migratory bird/silviculture study
- *Threatened and Endangered and Special Concern Species*
  - ♦ Conducting eagle movement study
- *Range Management*
  - ♦ Developing and implementing soil borrow area reclamation plan
- *Forest Management*
  - ♦ Establishment of additional forest plantings
  - ♦ Implementation of forest stand plans
- *Pest Management*
  - ♦ Control of insects and disease affecting ornamental aesthetics
  - ♦ Development of golf course pest control prescriptions

17.4. Implementation Funding Options

The ability of Fort Riley to implement this INRMP depends on funds from a variety of sources. Some of those funds are user fees generated by sales of permits whereas other sources are obtained directly from the DoD or DA. Donated funds from private, non-profit conservation organizations are an important source of supplemental funds. Each source has different application rules. AR 200-3 outlines the procedures for collecting and disbursing Agricultural funds (Chapter 2) and Sikes Act funds (Chapter 6, Fish and Wildlife). Implementation of this INRMP is financed from the following sources:

- Installation OMA budgetary allocations through the Army's Environmental Compliance Assistance Program (ECAP)
- Installation OMA non-ECAP budgetary allocations
- revenues generated from the sale of fuelwood, timber, and other forest products
- revenues generated from the sale of installation hunting and fishing permits
- revenues generated from the agricultural outleasing program
- funds donated to the installation from non-governmental organizations

The annual cost of executing the entire natural resources management program to implement this INRMP is approximately $4 million. The single largest funding requirement is that for the implementation of the installation’s ITAM program, which is projected to range from $900,000.00 to approximately $1,000,000.00 each year during the period covered by this plan of which support for salaries of both government and contracted employees is the largest component.

17.5. Command Support

Command support is essential to implementation of this INRMP. Many specific projects and program priorities and their funding require approval from the installation's Command Group and the Commanders of higher-level Army Headquarters. Army and installation Commanders are dedicated to the INRMP process. Equally important, Command recognizes that the INRMP is the primary vehicle for sustaining training lands and, thus, combat readiness of its forces.

Army guidance for the installation Commander is provided within The *Commander's Guide to Environmental Management* (U.S. Army Corps of Engineers, 1994*).* The *Guide* provides direction for specific natural resources areas instructing installation Commanders to undertake the following actions with respect to the following programs and operations:

17.5.1. Natural Resources Program

- Plan land utilization to avoid or minimize adverse effects on environmental quality.

- Where applicable, enter into Cooperative Plan Agreements or Memorandum of Understanding with conservation agencies for the conservation and development of fish and wildlife, soil, recreation, and other resources.

- Appoint and ensure functioning of the Natural Resources Conservation and Beautification Committee beginning in 2002.

17.5.2. Fish and Wildlife Management

- Prepare and implement an INRMP in coordination with appropriate state and Federal fish and wildlife conservation agencies and update at least once every five years.

- Allocate funds to conduct an effective INRMP program.

- Require optimum use and staffing of professionally trained personnel (e.g., wildlife managers).

- Establish a Fish and Wildlife Enforcement Program to ensure all hunting and fishing regulations are followed.

17.5.3. Forestry Management

- Establish optimum staffing with appropriately trained personnel.

- Develop and implement a management plan that will provide maximum multiple-use benefits.

17.5.4. Land Management

- Seek supplementary aid from appropriate natural resources agencies (Federal, state, and local) for technical assistance.

- Develop cooperative agreements with appropriate natural resources agencies.

- Determine the most environmentally acceptable land use as dictated by such factors as soil, water, vegetation, climate, and topography.

- Avoid those land uses determined to have a detrimental effect on the environment.

- Ensure that outleased lands are available to the maximum practical extent and prepare reports of availability for outleasing.

- Periodically inspect outleased lands to ensure compliance with maintenance and conservation requirements.

- Apply multiple use concept whenever possible.

17.5.5. Pest Management

- Designate a professionally trained pest management coordinator to ensure that all installation pest management regulatory and reporting requirements are met.

- Prepare and submit an installation pest management plan for MACOM approval that addresses all organizations and activities, including outlease and outgrant programs, that require applications of pesticides.

- See that the pest management program is staffed by a sufficient number of DoD-certified pesticide applicators, supervisors, and contract quality-assurance evaluators to ensure that pesticides are handled and applied according to government health and environmental requirements.

- Support IPM to help limit risks if pesticide resistance and environmental contamination result from excessive applications of pesticides at the installation.

- Ensure that pest management activities are referenced in other installation environmental documents (e.g., EA/EIS's, Spill Contingency Control Plans, Endangered Species Management Plans) to foster better coordination as part of the installation master planning process.

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